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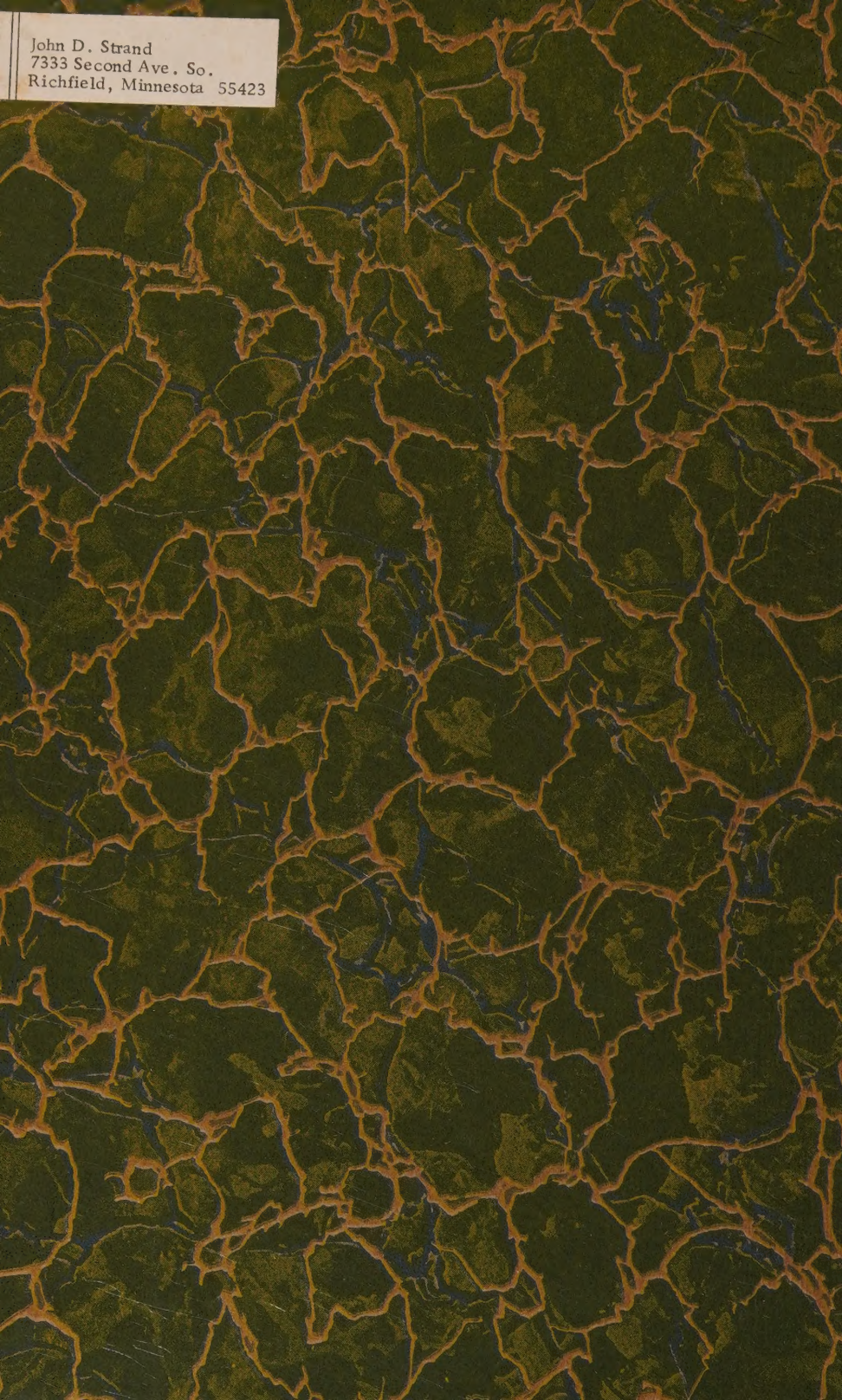

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International Library of Technology

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Painting and Interior Decoration

130 Illustrations, 18 in Colors

By

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INTERIOR DECORATION

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PREFACE

The volumes of the International Library of Technology are made up of Instruction Papers, or Sections, comprising the various courses of instruction for students of the International Correspondence Schools. The original manuscripts are prepared by persons thoroughly qualified both technically and by experience to write with authority, and in many cases they are regularly employed elsewhere in practical work as experts. The manuscripts are then carefully edited to make them suitable for correspondence instruction. The Instruction Papers are written clearly and in the simplest language possible, so as to make them readily understood by all students. Necessary technical expressions are clearly explained when introduced.

The great majority of our students wish to prepare themselves for advancement in their vocations or to qualify for more congenial occupations. Usually they are employed and able to devote only a few hours a day to study. Therefore every effort must be made to give them practical and accurate information in clear and concise form and to make this information include all of the essentials but none of the non-essentials. To make the text clear, illustrations are used freely. These illustrations are especially made by our own Illustrating Department in order to adapt them fully to the requirements of the text.

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PAINTING AND WOOD FINISHING

PAINTING

DEFINITIONS

1. Painting.—*Painting* is the process of covering the surfaces of wood, metal, brick, plaster, and other materials with a thin coating of liquids that will protect the surfaces from the effects of water, air, etc., and will also impart a decorative appearance to the materials. The liquids that are applied are called *paints*. In drying they form hard, durable films over the surfaces to which they are applied.

There are many kinds of paints used for special purposes, such as fireproofing, waterproofing, painting metals, brickwork, and plaster. The most common form of paint is, however, oil paint which is used in painting woodwork and for many other purposes.

2. Wood Finishing.—*Wood finishing* is the operation of applying transparent or semitransparent liquids to wood surfaces with the objects of preserving and enhancing the beauty of the color and the grain, or figure, of the wood. The materials applied consist of *stains, fillers, shellac, varnish,* and *wax*. The application of each of these separate materials is known as *staining, filling, shellacking, varnishing,* and *waxing*. Certain chemicals are used in the process known as *fuming*.

3. Scope of the Subject.—In this Section, the work of the painter will be limited to the painting and finishing of the exteriors and interiors of buildings.

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PAINTS

COMPOSITION OF PAINTS

4. Paint is composed of two principal parts, or ingredients, called pigments and vehicles. *Pigments* are the solid materials in paints, and give the paint its body, color, and covering capacity. *Vehicles* are oils, varnishes, water or other liquids with which the pigments are mixed. Vehicles such as oils and varnishes act as binders, which dry and hold the pigment in place on the surfaces to which the paint is applied. When water is the vehicle used, binding quality is given to it by the addition of a glue solution.

5. *Thinners* and *driers* are usually added to the mixed pigments and vehicles. The thinners are used to make the paint thin or liquid enough to flow easily from the brush. For oil paints, turpentine is the best-known thinner. In water paints, water is used as the thinner. Driers are added to paints, especially to oil paints, so that they will dry within a reasonable time after the application of the paint. Driers should always be used in moderation, as their use in excessive quantities will destroy the useful qualities of the paint.

6. Oil paints, or paints made with an oil vehicle, resist the effects of weather best. Water paints, in which a solution of water and glue is the vehicle, are dissolved by water and are, therefore, not adaptable to exterior use or where the painted surfaces are exposed to moisture.

PIGMENTS

7. White Lead.—White lead is one of the most useful of all pigments. Chemically, it is a basic carbonate of lead. White lead may be obtained in a dry powdered form, or as a heavy paste made by grinding it with linseed oil. The latter, known as *keg lead,* is the more common form. The dry pigment is used to make putty. Keg lead is used in oil paints and

must be diluted or thinned to a proper consistency before it can be used. The thinning is done by adding linseed oil and turpentine, and stirring the mixture until the pigment is broken up to the desired consistency, and a smooth fluid paint is obtained.

White lead never cracks or peels, but in course of time becomes chalky and gradually returns to its original powdered form, when it may be dusted off the surface to which it has been applied. It is sometimes adulterated by the addition of various substances, such as barytes, or sulphate of baryta, whiting, sulphate of lime, and chalk. Barytes, the most common adulterant, is a dense, heavy white substance very much like white lead in appearance. All adulterants are added simply for the purpose of cheapening the product, and should, therefore, not be used.

8. Zinc White.—Next to white lead, zinc white, or oxide of zinc, is the most used among the white pigments. It is a whiter material than lead, and considerably lighter in weight. It is very permanent, and unlike white lead, it does not have a tendency to turn yellow when excluded from the light. Zinc white is ground usually in linseed oil, as is white lead. In comparison with white lead, it lacks opacity or hiding power. Zinc white does not chalk like white lead, but has a tendency to dry hard and brittle. Repeated use of zinc white for exterior painting is apt to result eventually in the cracking and shelling off of the material.

9. Whiting.—Whiting is found in a nearly pure state in the earth in the form of chalk. It may be used as a pigment by removing the coarse particles of chalk and the impurities found with it, and then crushing and powdering the chalk to the necessary fineness. Whiting thus made forms the ordinary commercial whiting. It is used chiefly for making calcimine and for putty.

10. Barytes.—Barytes, or sulphate of baryta, is a very heavy pigment that is prepared by crushing and grinding mineral baryte, a crystalline rock found in many parts of the world. It is used as an adulterant of white lead.

11. Lithopone.—Lithopone is a compound of barytes and zinc sulphide. It is a very heavy, dense, white pigment, and is the base for most "flat" wall paints. Paints made with lithopone have great body and hiding value.

12. Lampblack.—Lampblack consists of nearly pure carbon. It is obtained by burning oil in an insufficient supply of air, thereby converting it into soot. The lampblack thus produced is oily and slow-drying, and when used for exterior painting it possesses great durability.

13. Carbon Black.—In comparison with lampblack, carbon black is much more intense as to color. Its covering power or hiding power is stronger than that of lampblack, and its durability for exterior painting is nearly as good. The process of manufacture resembles that of lampblack, as carbon black is the soot gathered from the burning of crude tar by-products, tar liquid, benzol, etc. It is frequently referred to as *gas black*.

14. Ivory Black and Bone Black.—The pigment called ivory black is produced by the calcination or burning of waste pieces of ivory. The term *bone black* or *drop black* is applied to material produced by burning bones. The black obtained from calcined bones has a slightly reddish tint in comparison with ivory black, which is denser as to color, and naturally more expensive.

15. Graphite.—The substance known as graphite is also called plumbago and black lead. It is a pure carbon mined like other ores, and is also made commercially from charcoal and cast iron. It is a soft black dry pigment, and is usually mixed with silica and linseed oil for painting ironwork, usually over a priming coat of red lead. It is also made up into a number of special paints for various purposes, on account of the fact that it is unaffected by exposure to air, gases, smoke, or weather.

16. Prussian Blue.—The pigment known as Prussian blue is made by mixing yellow prussiate of potash with some salt

of iron. This pigment dries well with oil, and is much used for mixing dark blues, for making purples, and for intensifying blacks. Slight differences in the manufacture give considerable variation in tint and color, which causes the material to be known under various names, such as Antwerp blue, Chinese blue, etc.

17. Ultramarine Blue.—Ultramarine blue is a pigment obtained from the precious stone known as lapis lazuli, which is found in Persia, Siberia, and China. Its costliness places it outside the colors commonly used by house painters, but its beautiful shade causes its name to be applied to several imitations, or artificial ultramarines. It is used for decorative purposes and has poor covering properties. It should not be used in connection with white lead, as the sulphur it contains has a tendency to darken the lead. Ultramarine blue and zinc white may be mixed together with perfect safety.

18. Cobalt Blue.—Cobalt blue, as manufactured today, does not differ greatly from ultramarine blue. When used for tinting purposes, however, cobalt blues mixed with zinc or lead produce a turquoise or sky-blue shade, whereas ultramarine blue under similar conditions would give a violet shade.

19. Other blues that the average painter rarely has occasion to use are indigo, Milori blue, Antwerp blue, Chinese blue, and Brunswick blue. They possess the characteristic of all blues, being fugitive, or having a tendency to fade.

20. Chrome Yellow.—Chrome yellow is a fairly permanent pigment, of great durability when used for exterior work. It is made in a variety of shades, varying from a lemon yellow to deep orange, and is very opaque, possessing strong covering or hiding powers.

21. Yellow Ocher.—Yellow ocher is a natural clay, colored by oxide of iron, found abundantly in the United States, France, and England. It is sometimes brightened by the addition of certain portions of chrome yellow and marketed under the name of chrome ocher. It is used for tinting purposes,

where its color permits. If used in too large proportions on exterior work, it impairs the durability of the paint.

22. Naples Yellow.—Naples yellow is composed of the salts of lead and antimony. It is a very opaque pigment, and, therefore, covers thoroughly the surface to which it is applied.

23. Vermilion.—The red pigment known by the name of vermilion is a sulphuret of mercury, which, previous to its being ground to powder, is called cinnabar. It is the heaviest pigment the painter uses, is of an oily nature and of the brightest red color. It mixes readily with the different oils or varnishes in its dry powdered state. It is not a permanent color, as it has a tendency to fade and lose its brilliancy when exposed to a strong light. It is opaque and covers the surface very well.

24. Red Lead.—Red lead is a dioxide of lead. When pure it is unaffected by light; but acids, white lead, or any oxide or preparation of metal soon deprives it of color, while impure air will blacken and ultimately neutralize it.

25. Venetian Red.—True Venetian red is a native ocher, but various pigments sold under this name are prepared from sulphate of iron. It possesses strong covering properties, and is one of the best earthen pigments to be used in connection with ordinary exterior painting.

26. Indian Red.—The pigment known as Indian red is a ground hematite or peroxide of iron, brought from Bengal, India. It may, by calcining sulphate of iron, be artificially prepared. Its tints vary greatly, but the best are those of a rosy hue. This pigment, a red of a purple-russet hue, has a good body, and is valued, when fine, for the pure lake-like tone of its tint. It is very permanent, unaffected by light, impure air, or mixture with other pigments. Defying the effects of time or fire, it remains an opaque color, covering its surface satisfactorily. Indian red is sometimes called Persian red.

27. Scarlet Lake.—Scarlet lake is one of the numerous lakes made from cochineal, others being Florentine lake, Hamburg lake, Chinese lake, Roman lake, and carminated lake.

28. Carmine.—Carmine is a deep, rich red obtained from the dried and powdered bodies of the female cochineal insect, found in Persia and other oriental countries. The genuine material is very expensive. It is not an opaque color, but rather transparent, and is used for tinting and glazing purposes where rich effects are desired.

29. Chrome Green.—Chrome greens of various depths of color are compound pigments of which chrome yellow is the principal coloring substance, Prussian and other blues being added to obtain the desired shade. Of all greens they are the most generally used, being suitable for most classes of house painting and decorating. Chrome greens are very opaque, and in their pure state possess strong tinting powers.

30. Brunswick Green.—Brunswick green is one of a large class of pigments grouped under the name of copper greens, and including verdigris, verdite, malachite, mineral green, Vienna green, emerald green, and marine green.

31. Emerald Green.—The name of emerald green is given to a copper green made of verdigris mixed with a solution of arsenious acid. It is brilliant in color, very poisonous, and difficult to grind. It is the most vivid of the copper greens, is rather opaque, reflects light powerfully, and appears to be the most durable pigment of its class.

32. Umber—The brown pigment known as umber is obtained from natural colored clays found in Italy and Turkey. In its natural state it is called raw umber; but if raw umber is subjected to heating at a low temperature, a pigment of a darker color is produced, which is called burnt umber.

33. Vandyke Brown.—The original Vandyke brown, as used by the painter whose name it bears, is a kind of bog earth, of a fine, deep, semitransparent brown color; but the pigments of that name in use at the present day appear to be earthy substances of a similar kind, purified by grinding and washing.

34. Sienna.—Sienna in the natural state, known as raw sienna, is an iron ore or earth, fine and smooth, prepared by

powdering the material taken from the vein or mine. In appearance it somewhat resembles yellow ocher. If it is roasted by the application of heat, it becomes burnt sienna, which has a deep orange color, is more transparent, and quicker in drying than raw sienna, and is a valuable color in graining. Both raw and burnt sienna are valuable tinting colors in combination with white pigments, and are much used by grainers in imitating natural wood.

35. Asphalt and Other Pigments.—Asphalt and certain other materials and pigments are used to some extent in special paints.

VEHICLES

36. Linseed Oil.—Linseed oil is a vegetable oil of a yellowish tint. When exposed to the air, it dries slowly through the absorption of oxygen, and forms a glossy, elastic film that possesses great durability. To the extent that the proportion of linseed oil in paint is increased, the elasticity is improved, and the wearing qualities are enhanced. When the quantity of linseed oil is reduced and volatile oils are added, the elasticity and durability as well as the glossiness of the mixture are correspondingly reduced.

37. Raw linseed oil is extracted by grinding flaxseed, heating it, placing it between plates, and then pressing it until the remaining cake contains the least possible quantity of oil. The oil is stored away in large tanks for the purpose of allowing it to settle and clarify. The accumulation of refuse formed at the bottom of the tanks, known as foots, is drawn off and used in the preparation of cheaper classes of paint materials.

In the rare instances where the least yellowness in the oil is objectionable, nut oil or poppy oil may be used with advantage, but for general purposes linseed oil is much to be preferred.

38. Boiled linseed oil, commonly called *boiled oil,* is prepared by heating the raw oil in an open kettle to about 225° F., so that any moisture the oil may contain will be

driven off. This heating will cause the oil to thicken, and improve its drying qualities. To improve still further the drying properties of the oil, certain quantities of litharge, manganese, or other strong drying agents are added.

39. Nut Oil.—Nut oil, an almost colorless, transparent oil, is expressed from the walnut. Its drying properties do not differ much from those of linseed oil, and owing to its lack of color it is principally used for white and other paints of a delicate shade. In ordinary house painting, however, it is seldom used.

40. Poppy Oil.—Poppy oil is colorless and very slow drying. It is sometimes used for delicate work where the time required for drying is not limited. For strength and durability, it may be considered as standing second to linseed oil.

41. Tung Oil.—Tung oil, or China wood oil, is made from the nuts of a Chinese tree. This oil dries faster than linseed oil, and the surface dries flat, or without a gloss. The oil is used in preparing flat paints, and to some extent in the manufacture of varnish.

42. Other Oils.—Other oils are sometimes used in the painting business, though generally as adulterants. Their existence in paint can sometimes be detected by the sense of smell, but frequently only a chemical analysis will determine their presence.

43. Water.—Water is used as the vehicle in mixing certain paints or coatings for exterior work that are to be applied to brick, concrete, or stucco surfaces. The pigment in such cases is frequently in the nature of a cement, which sets or hardens when mixed with water. Water is also used as a vehicle for interior paints known as calcimines, cold water paints, etc., which have some form of glue for a binder. Water is also used in the preparation of whitewash, which may be applied to both exterior and interior surfaces. With some materials cold water is used. With others warm water is required. The manufacturer of the material usually specifies how the material is to be mixed and used.

THINNERS

44. Purpose of Thinners.—In order to cling to wood surfaces, the paint must penetrate beneath the surface of the wood. This is accomplished by the use of thinners, or evaporating liquids that will work into the pores of the wood, and carry particles of pigment and a portion of the oil with them. The thinners also make the paint flow freely from the brush, and spread out smoothly on the surface. The use of a thinner, such as turpentine, adds also to the drying qualities of a paint.

45. Turpentine.—Turpentine is the best and most extensively used thinner for oil paints.

In the preparation of turpentine the sap of several species of pine trees grown in the southern states, is gathered by tapping the trees and collecting the liquid. By a process of distillation of the liquid, pure turpentine, sometimes called *spirits of turpentine,* is obtained.

Turpentine is a thin liquid, water-like in appearance, with a strong though not unpleasant odor. It is volatile, and through evaporation aids in the drying of materials, though of itself not a drying oil. If used in paints, it is invariably in connection with the heavier drying oils, such as linseed oil, which provide the binder. Were any pigment to be mixed with turpentine alone, it could, shortly after application, be brushed off like so much powder, as the turpentine will have evaporated completely. The effect of turpentine, when mixed with pigments, is to cause the paint to *flat,* or *flatten,* that is, to lose its luster, in proportion to the amount of turpentine used. The flattening is due to the evaporation of the turpentine. Thus, a paint mixed with linseed oil only will dry with a full oil gloss, and the same paint thinned to a working consistency with one-quarter linseed oil and three-quarters turpentine, will dry with what is known as an egg-shell gloss. One-eighth linseed oil and seven-eighths turpentine will produce a dead flat color. Any degree between the two extremes may be obtained by simply varying the proportions of turpentine and oil.

46. Substitutes for Turpentine.—Turpentine substitutes are sometimes used with good results for certain classes of work, such as flattening down paints required for ceilings and wall decorations. Most of these substitutes are derived from the distillation of crude or mineral oils.

DRIERS

47. Purpose of Driers.—*Driers* are substances added to paint to cause the oil to solidify more rapidly. The drying of linseed oil, as previously stated, is caused by the absorption of oxygen, and there is little doubt that driers act simply as carriers of oxygen to the oil, a very small quantity of drier yielding positive results. The best driers, therefore, are those containing a large proportion of oxygen, such as litharge, acetate of lead, red lead, sulphate of zinc, etc. These driers, which are usually furnished in liquid form, are added in small quantities to paint that has been reduced to a consistency ready for use. Some paints, unless driers are added, will remain tacky and soft for an indefinite time.

48. Kinds of Driers.—The following driers are suited to some particular quality or color of paint. *Red lead* makes a good, cheap drier, but can be used only in paints in which its color is unobjectionable. *Sugar of lead,* or *acetate of lead,* ground in oil, is the best but most expensive of all driers, and like *copperas,* or *sulphate of iron,* and *white vitriol,* or *sulphate of zinc,* is generally used to promote the drying of white paints, or paints of delicate tints.

Litharge, or *oxide of lead,* the drier most commonly used, is produced in the oxidation of lead containing silver. It can be procured on a small scale by scraping off the dross that forms on molten lead exposed to a current of air.

Massicot is a superior kind of litharge, produced by heating lead to a degree insufficient to fuse the oxide.

Oxide of manganese is quick in effect, but, being of a very dark shade, is seldom used except for the deeper tone colors.

Sulphate of manganese is the best drier for ordinary white. The manganese should be mixed with a small quantity of the paint first and then added to the bulk. If great care is not taken in mixing the drier, the work will be spotted.

Zinc white is a natural drier in itself, and when added to white lead, no other drier is needed as a rule. Not more than 25 per cent. of zinc by weight should be used with white lead for outside work.

49. Japan.—Japan is really a hard, quick-drying varnish to which other ingredients, such as litharge, manganese, sugar of lead, etc., have been added to make it dry still more rapidly. It is heavy-bodied, being of about the same consistency as varnish. When thinned down with turpentine, it is known as turpentine japan or drier, and is used by house painters as a drier on all classes of work.

50. Other Driers.—Other driers of a cheap character for interior work are those containing a combination of the drying materials previously referred to, with benzine or naphtha as the thinning agent. They have nothing to recommend them but the price, and much injury may be done to an otherwise first-class material by the addition of these cheap driers.

51. Care in Using Driers.—When using driers, care should be taken not to use them unnecessarily with pigments that dry well in oil. They should not be used in excessive quantities, as they will then retard the drying or injure the paint. They should not be added to the color until ready for use, and more than one kind of driers should never be used in the same lot of paint.

MIXING PAINTS AND COLORS

THEORY OF COLOR

52. Primary Colors.—The three primary colors are red, yellow, and blue. They are so called because all other colors may be produced by combinations of them, in connection with white and black, which are not classed as colors. The mixing

of any two of the primary colors produces a secondary color, and as there are but three primaries, there can be but three secondary colors. The three primary colors, when mixed in pairs, form the three secondaries, as follows: Red combined with yellow forms orange, red combined with blue produces violet, and yellow combined with blue gives green.

53. Secondary Colors.—The proportions of a perfect orange are five of primary red to three of primary yellow. When orange inclines to red, it takes the name of scarlet, poppy, etc. Orange combined with green forms citrine, a tertiary color. Combined with violet it produces russet, another tertiary color. It is preeminently a warm color.

Of all compound colors, green is the most effective, distinct, and striking. It is a perfect hue when composed of three parts of yellow to eight of blue, of equal intensities. Mixed with orange, green produces the tertiary color citrine, and mixed with violet, it produces olive, the other extreme tertiary.

Violet is composed of red and blue in the proportion of five of red to eight of blue. Mixed with green, it produces olive, mixed with orange, it produces russet. Violet, when inclining to red, takes the name of crimson. Violet may be made by the mixture of ultramarine blue and vermilion, or of Prussian blue and lake, with varied proportions of white. With increased additions of white, the various tints of lavender, lilac, etc., are produced.

54. White.—White is not generally considered as a color. It is, in fact, a combination of all the primary colors. White pigments, principally white lead and zinc white, are used as the basis for most paints. The combinations of the various colors with white are called *tints*.

55. Black.—Black is the opposite of white. Black is what is known as a cold color; that is, it is devoid of the brilliancy of such colors as red, yellow, orange, etc., which are called warm colors. Black imparts coldness to all colors with which it is mixed. It gives, for instance, a purplish tinge to red, it turns yellow into green, and gradually turns white to a bluish gray.

METHODS OF MIXING PAINT

56. Hand Mixing.—Paints such as white lead and zinc white are bought from the manufacturer in the form of thick pastes. The pastes consist of the pigment ground in the vehicle, which in the case of oil paints, is generally linseed oil. The paste in the case of white lead consists of about 8 per cent. oil and 92 per cent. pigment. The first process in mixing the paint is to *break up* the paste; that is, to add sufficient vehicle to the paste so that it can be used as paint. The required amount of paste is put into an empty keg or bucket, and a small quantity of oil is added. The oil is worked into the paste thoroughly by means of a small wooden paddle. One pint of oil is used, at first, for 100 pounds of paste. After the first pint of oil is incorporated with the paste so as to make a smooth even mixture, the process is repeated and a second pint is worked into the paste. The addition of the oil naturally makes the paste thinner. More oil is mixed with the paint, 1 quart at a time, until about 6 quarts have been added to each 100 pounds of paste.

The paint will then be well mixed and can be thinned as required by the addition of more oil or turpentine. When the paint is reduced to the proper consistency it should be strained through a piece of cheesecloth or fine metal screening so as to remove any lumps, skins, or foreign matter from the paint. The successive operations of mixing and straining will produce a smooth and easy-flowing mixture that can be applied successfully with the brush.

If tinting colors are to be added, they should be broken up if in paste form, or should be mixed with oil if in powdered form. The colors should be quite thin when added to a mass of white paint, a little at a time, and should be thoroughly mixed in. This is best done before straining the paint. The color of the mixture should be tested as it approaches the desired color by brushing some of it on a piece of wood. This sample should be examined in the daylight.

When two batches of paint of different tints are to be mixed, this is often done by pouring them from one bucket into

another repeatedly until they are uniform in color and consistency. A drier should be added before the paint is thinned down to its working consistency and is ready to be applied to the surface.

Sufficient paint should be mixed and tinted in the beginning to finish the job, as it is generally difficult to match a color exactly if it becomes necessary to mix a further supply.

57. Machine Mixing.—Machine mixing is usually done by manufacturers of paints. Some large paint shops are equipped with mixing machines, which are very useful when there is a great deal of mixing to be done.

58. Consistency of Paint.—No rules can be given for the consistency of paint. It must cover well, spread evenly with the brush, and must not run after it is applied. The consistency of the paint will be determined in some cases by the nature of the surface to be covered. Thus, in priming, or giving the first coat to new wood, the paint should be thinned somewhat with linseed oil, which must enter the open pores and saturate the wood. In the case of priming yellow pine, the paint should be thinned with turpentine, as the wood will not absorb oil. The paint in general should be thin enough to brush out well and at the same time it should cover the surface completely.

There is some variation in the thinning qualities of linseed oil made by different manufacturers, or from seed from different localities. The consistency of the paint may be tested by brushing or painting a small area, observing the covering power, and the ease with which it can be spread with the brush.

59. Formulas for Paint Mixtures.—Table I gives formulas for mixing paints such as are used in painting the woodwork and plastered walls of buildings. The principal pigment used in these formulas is white lead, and the vehicle is linseed oil. Tinting colors can be added to the formulas to obtain most of the colors generally used. In this table the amounts of the ingredients for various conditions are given, as well as for different coats and finishes. It should be real-

TABLE I

FORMULAS FOR PAINTS FOR VARIOUS PURPOSES

1. New Unpainted Outside Woodwork

Ingredients	Priming Coat	Second Coat	Third Coat
White lead.....	100 pounds	100 pounds	100 pounds
Linseed oil (raw).	4 gallons	1½ gallons	4 gallons
Turpentine	2 gallons	1½ gallons	1 pint
Drier	1 pint	1 pint	1 pint
Amount made.....	9 gallons	6 gallons	7 gallons
Square feet covered	4,500	3,300	3,850
Square feet per gallon	500	550	550

2. Old Painted Outside Woodwork

Ingredients	Priming Coat	Second Coat	Third Coat (Gloss)
White lead.....	100 pounds	100 pounds	100 pounds
Linseed oil.....	2 gallons	3 gallons	4 gallons
Turpentine	2 gallons	½ gallon	1 pint
Drier	1 pint	1 pint	1 pint
Amount made.....	7 gallons	6½ gallons	7 gallons
Square feet covered	2,450-3,500	3,300	3,850
Square feet per gallon	350-500	550	550

3. New Unpainted Inside Woodwork

Ingredients	Priming Coat	Second Coat	Third Coat (Oil Gloss)	Third Coat (Flat)
White lead.....	100 pounds	100 pounds	100 pounds	100 pounds
Linseed oil.....	3 gallons	1½ gallons	3½ gallons	
Turpentine	4 gallons	1½ gallons	1 pint	3 gallons
Drier	1½ pints	1 pint	1 pint	½ pint
Enamel varnish...				1 pint
Amount made.....	10 gallons	6 gallons	6½ gallons	6 gallons
Square feet covered	5,000-6,000	3,000-3,600	3,300-3,900	3,600
Square feet per gallon	500-600	500-600	500-600	600

TABLE I—(*Continued*)

4. Old Painted Inside Woodwork

Ingredients	Priming Coat	Second Coat (Oil Gloss)	Second Coat (Eggshell)	Second Coat (Flat)
White lead.....	100 pounds	100 pounds	100 pounds	100 pounds
Linseed oil.....	1 gallon	3½ gallons		
Turpentine	2 gallons	1 pint	2 gallons	2 gallons
Drier	1 pint	1-1½ pints	½ pint	½ pint
Enamel varnish...			½ gallon	1 pint
Amount made.....	6 gallons	6½ gallons	5¼ gallons	5 gallons
Square feet covered	2,100-3,600	3,575-3,900	2,888-3,150	3,000
Square feet per gallon	350-600	550-600	550-600	600

5. Plastered Walls

Ingredients	Priming Coat	Body Coat	Finishing Coat (Flat)	Finishing Coat (Full Gloss)
White lead.....	100 pounds	100 pounds	100 pounds	100 pounds
Linseed oil.....	6 gallons	1½ gallons		4 gallons
Turpentine	1 gallon	1½ gallons	2½ gallons	1 pint
Drier		1 pint	½ pint	½ pint
Enamel varnish...			1 pint	
Amount made.....	10 gallons	6 gallons	5½ gallons	7 gallons
Square feet covered	5,750	3,600	3,300	4,200
Square feet per gallon	575	600	600	600

6. New Floors, Soft Woods (Inside)

Ingredients	Priming Coat	Second Coat	Finishing Coat
White lead.....	100 pounds	100 pounds	80 pounds
Zinc white.....			20 pounds
Linseed oil.....	4 gallons	1 gallon	¾ gallons
Turpentine	2 gallons	2 gallons	¼ gallon
Drier	1 pint	1 pint	1½ pints
Amount made.....	9 gallons	7 gallons	6½ gallons
Square feet covered	5,400	3,500-4,200	3,250-3,900
Square feet per gallon	600	500-600	500-600

TABLE I—(*Continued*)

7. New Floors, Hard Woods (Inside)

Ingredients	Priming Coat	Second Coat	Finishing Coat
White lead.....	100 pounds	100 pounds	80 pounds
Zinc white.....			20 pounds
Linseed oil.....	3 gallons	1 gallon	3 gallons
Turpentine	2 gallons	2 gallons	¼ gallon
Drier	1 pint	1 pint	1½ pints
Amount made.....	10 gallons	7 gallons	6½ gallons
Square feet covered	6,000	3,500-4,200	3,250-3,900
Square feet per gallon	600	500-600	500-600

8. Porch Floors, Hard or Soft Woods

Ingredients	Priming Coat	Second Coat	Finishing Coat
White lead.....	34 pounds	100 pounds	80 pounds
Red lead.....	66 pounds		
Zinc white.....			20 pounds
Linseed oil.....	5 gallons	1 gallon	3 gallons
Turpentine	1 gallon	2 gallons	¼ gallon
Drier	¼ pint	1 pint	1½ pints
Amount made.....	9 gallons	7 gallons	6½ gallons
Square feet covered	4,500	3,500-4,200	3,250-3,900
Square feet per gallon	500	500-600	500-600

ized that these amounts can be varied. Each painter has his own ideas regarding this matter. Weather conditions, moisture, heat, and cold, all affect paint and must be taken into consideration when mixing the paint. In cold and damp weather the paint does not dry quickly and more drier must be added than will be required in dry warm weather.

The figures in Table I for the covering capacity of paint are based upon the use of lumber that has been planed at the mill. These figures are average or approximate. With soft woods and light-colored paint less surfaces would be covered. With hard woods and with dark-colored paint more surface would

be covered. Authorities on painting differ greatly regarding this matter. In fact, the covering capacity depends upon the amount of vehicle and the skill of the painter, both of which are variable.

COVERING CAPACITY OF PAINTS

60. The surface that may be covered with a gallon of paint depends upon several factors. An expert painter will cover 25 per cent. more surface than one not so experienced, using the same kind of paint; and his work will look as well. The thinner the paint film is spread, of course, the more surface it will cover. When three coats are given, it is well to brush the paint out thin. The important point on all work is to brush the paint out only as far as it will go and still hide the surface well. Light-colored paint applied over a dark-colored surface must be spread thicker than over white or other light tints. Dark paint will hide a surface better, obviously, than white or very light tints, and can, therefore, be brushed out thinner. More surface can be covered by dark colors, as a rule, than by white and light colors.

61. A rough surface will require more paint to cover it than a smooth one. Lumber which is soft and porous will absorb more oil and will require more paint than a hard, close-grained wood. This applies to the first coat only.

62. Different brands of strictly pure white lead will vary in covering power. This is due sometimes to varying proportions of carbonate and hydrate, and sometimes to the fineness of the lead pigment.

63. A gallon of white lead white paint will cover from 200 to 300 square feet, two coats, depending upon the surface to be painted. On hard, smooth, new wood that has been primed, the paint will cover 300 square feet, two coats. On old wood that is dry and will absorb considerable oil, a gallon may not cover more than 200 square feet, two coats.

64. The amount of surface that will be covered by the first coat of white paint on new wood depends upon the char-

acter of the lumber, whether porous or hard and well-filled with sap. This coat is mixed quite thin to have sufficient oil to satisfy the wood suction. Only enough pigment is provided to afford a foundation for succeeding coats. When only two coats are to be put on (which is a mistake for new work) the first coat must be made thicker. The covering capacity of 1 gallon of white paint for the priming coat will be found to be about 350 to 500 square feet, one coat only.

When tinting colors are added to produce colored paint the amount of surface that a gallon of paint will cover increases as the colors become darker.

READY-MIXED PAINTS

65. Qualities.—Instead of mixing the ingredients of paint on the job or in the shop, painters frequently use prepared paints that are mixed and sold by paint manufacturers. The manufacturers incorporate in the paints all the elements or materials that they think are necessary. Certain manufacturers use only the best materials and have built up reputations for selling dependable paints. There are, however, some manufacturers who are not so scrupulous and manufacture cheap paints of uncertain quality. The best grades of ready-mixed paints can be used safely and have the advantage of being thoroughly mixed and uniform in quality and color.

The best grades of ready-mixed paints contain lead and zinc pigments, which constitute not less than 85 per cent. of the mixture. The remainder may consist of linseed oil, turpentine, and the ingredients that will, in the opinion of the manufacturers, improve the paint.

66. Specifications of the Bureau of Standards.—The specifications for ready-mixed paint suggested by the Bureau of Standards is: "Ready-mixed paints shall be well ground, shall not settle badly or cake in the container, shall be readily broken up with a paddle to a smooth, uniform paint of good brushing consistency, and shall dry within 48 hours to a full oil gloss, without streaking, running, or sagging. The color and hiding power when specified shall equal those of a sample

mutually agreed upon by buyer and seller. The weight per gallon shall be not less than 15¾ pounds.

"Pigment.—The pigment shall be composed of:

	Maximum Per Cent.	Minimum Per Cent.
White lead (basic carbonate, basic sulphate, or a mixture thereof)	70	45
Zinc oxide (ZnO)	55	30
Silica, magnesium silicate, aluminum silicate, barium sulphate, pure tinting colors, or any mixture thereof	15	0

"In no case shall the sum of the basic lead carbonate, basic lead sulphate, and zinc oxide be less than 85 per cent. The lead and zinc pigments may be introduced in the form of any mixture preferred of basic carbonate white lead, basic sulphate white lead, zinc oxide, or leaded zinc, provided the above requirements as to composition are met."

Manufacturers publish cards showing samples of the colors in which they make paints, from which desired colors may be selected.

SPECIAL PAINTS

67. Fireproof Paints.—Shingles and other wooden parts of a building are apt to take fire from burning fragments from another building. Fireproof paints are sold which are supposed to prevent wood from taking fire from such fragments. Ordinary paints, especially the vehicles, are inflammable, so that boric acid is added to the ordinary paint in the proportion of 1 pound of acid to each gallon of paint, to make it more or less fireproof. When subjected to heat the acid in the paint forms a glass that protects the wood surface from combustion. Other forms of fusible glass are also used, which melt when subjected to heat and protect the wood. There are objections, however, to all these paints, as the glass is liable to be washed out of the paint by rain.

68. Paints for Metals.—The best paint for metal surfaces, such as the surfaces of steel construction of all kinds, stairs,

fire escapes, fences, etc., is red lead in linseed oil. Red lead can be made almost pure and ground in oil. In this form it is sold as a paste similar to white lead. It can be "broken up" in oil as is done with white lead.

If, however, the red lead is not pure, and contains litharge, the pigment should not be mixed with oil until a few hours before using. The litharge acts as a drier and will cause the paint to oxidize quickly.

69. Damp-Proof Paints.—Except in certain cases, damp-proof paints are seldom applied to wood surfaces. Their use is confined almost entirely to masonry surfaces, such as brick, stone, and concrete. Some such preparations, which are mostly patented or secret, are colorless, so as not to affect the color of the work, while others are black, the natural color of the asphalt or bitumen of which they are composed. Some are of the nature of cement, and set when mixed with water. Some damp-proof paints are colored, mostly dark colors. The damp-proof materials may be asphalt, graphite, etc. Such paints are used to some extent in protecting steel and iron work.

INSPECTION OF MATERIALS

70. Difficulty in Determining Qualities.—The nature of painting materials makes it extremely difficult to determine their qualities from an inspection of the materials themselves. Even experience cannot be depended on to determine the presence of adulterants or inferior materials. Colorless and odorless materials may be added to the oil to cheapen it, affecting its durability. Lack of proper preparation and manufacture cannot always be detected, and the fineness of pigment or chemical composition is not easily determined.

71. Original Packages.—In order to assure satisfactory materials it is customary for architects to specify that all such materials as paints, oils, varnishes, etc., shall be brought to the job in the original packages from the manufacturer. The reputation of the manufacturer is thus depended upon as far as the materials are concerned. The presence of unlabeled

cans and bottles, or materials manifestly mixed before bringing them to the job usually causes a suspicion that inferior goods are being used. The reputation of the painter must be depended upon for the quality of the workmanship.

72. Mixing According to Directions.—The manufacturer has determined by careful experiment just how his materials should be used to insure the best results. The materials should, as far as possible, be mixed and used according to these directions.

73. Manufacturer's Guarantee.—The manufacturer of the material must conform to certain standards prescribed by various state laws. If the purchaser is familiar with the law, he is reasonably sure of what he is getting. The manufacturer's guarantee is for the materials only, and does not cover careless or improper mixing or the wrong application of the materials.

TIME TO PAINT

74. New Woodwork.—New woodwork on the outside of a building should be painted as soon as possible after the carpenters have completed their work. When exterior woodwork is allowed to stand for a week or more before being painted the joints and cracks are apt to open and will require considerable patching and puttying to make the woodwork fit for painting.

75. Moisture.—Paint should never be applied while it is raining or snowing, or when the wood is wet. Woodwork should not be painted when the temperature is below 40° F., as moisture is apt to condense on the surface of the wood and make it too wet to paint. Paint applied to a wet surface will blister and peel off.

76. Painting in Cold Weather.—Painting is sometimes done in freezing weather, but there is a decided risk in doing it. The paint is not likely to dry properly when subjected to a temperature below 40° F. Water is also apt to condense upon the surface of the wood at such temperatures.

The result is that the paint will scale or peel off. The best times to paint exterior woodwork are when the temperature is moderate and the weather dry. Such times occur in the spring and fall of the year.

77. Interior painting can, of course, be done at any season of the year, provided the work is dry. Heat and ventilation must be provided in some climates. The doors and windows must at times be left open to permit drying out of the paints, especially when water paints or calcimines are used, or when moisture is apt to condense on the walls. Ventilation is most important at such times, and heat must also be applied when necessary.

TOOLS AND EQUIPMENT USED IN PAINTING

BRUSHES

78. General.—Practically all house painting is done with brushes. The brushes used are of various sizes and shapes according to the different purposes for which they are employed. They are made of different materials to suit the character of the work and the material to be spread. Hog's bristles, camel's hair, badger's hair, bear's hair, ox hair, etc., all enter into the manufacture of brushes, each being intended for use in connection with certain materials and classes of work. The bristles are usually set in rubber, although they are sometimes set in cement or glue.

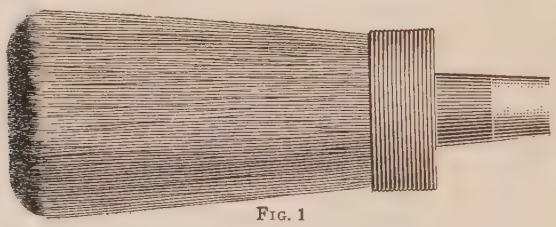

FIG. 1

79. Round Paint Brushes.—Round paint brushes, sometimes called pound brushes, are of the type shown in Fig. 1. They are made of stiff hog's bristles, and vary in size, being

distinguished by the marks 1/0, 2/0, 3/0, etc., up to 9/0. A 1/0 brush is $1\frac{1}{16}$ inches thick and the bristles are $3\frac{7}{8}$ inches long. An 8/0 brush is $2\frac{1}{16}$ inches thick and has bristles $5\frac{1}{2}$ inches long. It is the general custom to make them round, although occasionally they are made elliptical, commonly called

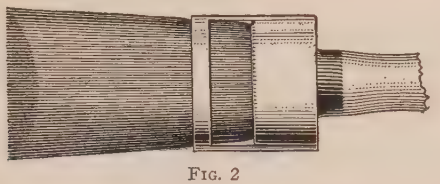

FIG. 2

oval. The bristles are $3\frac{7}{8}$ to $5\frac{3}{4}$ inches long, and the brushes, when new, to be serviceable, must be bound at the heel with twine or some other contrivance such as is shown in Fig. 2 to shorten the working portion of the brush.

80. Oval Paint Brush.—An oval brush made of black Chinese bristles, but with a wedge-shaped point, as shown in Fig. 2, is considered superior to the pound brush. These brushes are excellent for painting either exterior or interior work, and for varnishing. A good size brush for exterior painting is $2\frac{1}{2}$ inches in diameter and the bristles are about $4\frac{3}{4}$ inches in length. The brush in Fig. 2 is shown fitted with a metal bridle, which is sold with the brush. When the bristles have been worn down to a certain length the bridle can be removed.

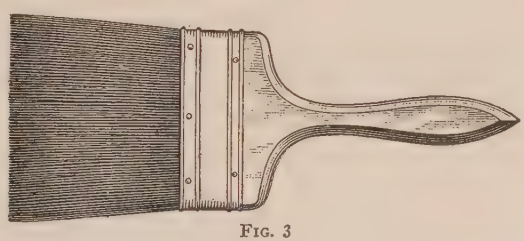

FIG. 3

81. Flat Wall Brushes.—Flat wall brushes are made of stiff hog's bristles, bound with metal or with leather, as shown in Fig. 3. They run from 3 to 5 inches in width, and the bristles are from 4 to 5 inches in length. These flat brushes are

used when it is desired to cover quickly a great amount of surface, as on walls and ceilings. When used for varnishing the bristles should be set in vulcanized rubber.

82. Oval Varnish Brushes.—Oval varnish brushes, similar to the type shown in Fig. 4, are made of hog's bristles,

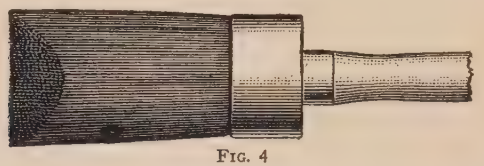

FIG. 4

usually of a softer grade than those entering into the manufacture of paint brushes. They are made in sizes from 3/0 to 8/0, and are chisel-pointed; in other words, there is a gradual taper of the bristles at the end of the brush, the bristles at the center being longer than those on the sides. The brushes are metal bound, and no bridling or binding is required. The size of a large brush of this kind is about $2\frac{5}{16}$ inches in its greatest width, with the bristles about 4 inches in length.

83. Sash Tools.—Sash tools, or brushes made for painting sash, are made of medium stiff bristles, and are generally round, but may be elliptical in shape, and are metal bound, although sometimes a twine binding is used. A metal-bound round sash tool is shown in Fig. 5. Brushes of this kind are

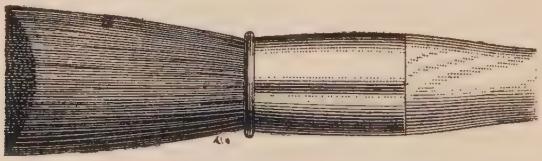

FIG. 5

made with either square or chisel-shaped ends. The sizes generally used run from No. 1 to No. 10. This type of brush is used for painting small portions of the work, such as moldings and sash-bars.

84. Calcimine Brushes.—Calcimine brushes, Fig. 6, should be from 6 to 8 inches wide and made of stiff Russian

bristles, which are heavier and thicker than most other varieties, and hold their stiffness better when used in a water vehicle.

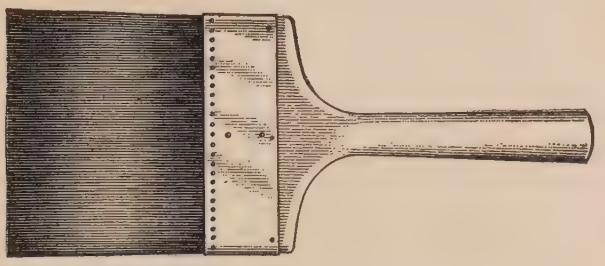

FIG. 6

They are also made, however, of black Chinese bristles. The bristles should be about $5\frac{1}{4}$ inches long. With longer bristles stiffness and texture are sacrificed for length.

85. Whitewash Brushes. Whitewash brushes, Fig. 7, are somewhat lighter in weight than calcimine brushes. They are from 6 to $9\frac{1}{2}$ inches long and set in cement, which will not be affected by the lime in the whitewash. The bristles are bound either in metal or leather. Whitewash brushes are usually made with a $\frac{3}{4}$-inch hole in the wood handle, in which a pole or stick may be inserted. This allows the painter to reach otherwise inaccessible places.

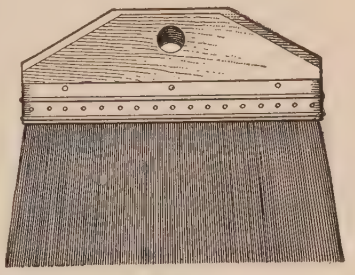

FIG. 7

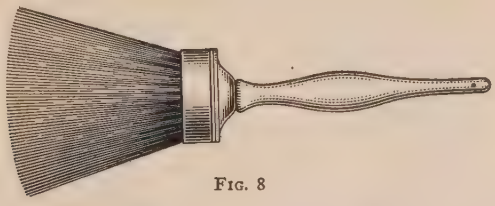

FIG. 8

86. Round Dusters.—The round duster, shown in Fig. 8, is used by the painter and varnisher in dusting off his work and

getting it ready for paint and varnish. Dusters are from 2 to $2\frac{1}{2}$ inches in diameter, and the bristles are from 4 to $4\frac{1}{2}$ inches in length. The dust produced by sandpapering the surface preparatory to painting must be removed before the first coat is applied. Likewise each coat of paint subsequently applied must, as a rule, be sandpapered and carefully dusted. The

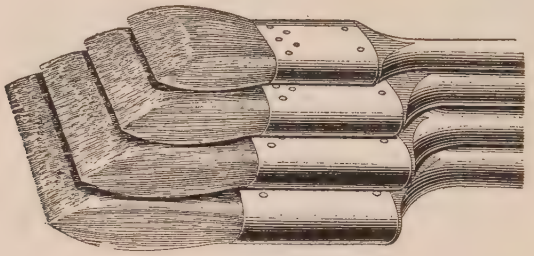

FIG. 9

duster is used for such purposes. The round duster is made of either white or black stiff bristles, and in two or three sizes. Dusters are also made flat, the bristles being 4 inches wide and $4\frac{1}{2}$ inches long.

87. Flat Bristle Varnish or Paint Brushes.—Several sizes of flat bristle varnish or paint brushes are shown in Fig. 9. These are made of white or black bristles, in sizes varying from 1 inch to 4 inches, the thickness and length of the bristles being governed by the width. They are metal bound and are used for all classes of painting and varnishing. They are usually set in rubber and vulcanized when used for varnish.

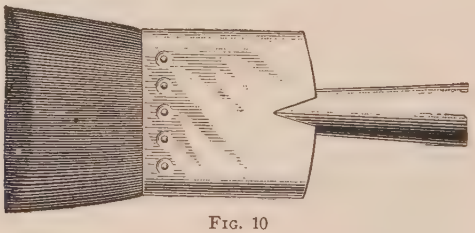

FIG. 10

88. Fitch Flowing Brushes.—One style of fitch flowing brush is shown in Fig. 10. This type varies from 1 inch to 4 inches in width. While originally they were made of bear's

hair, practically all are now made of skunk's hair. The hair is softer than bristle, and the brushes are useful in applying enamel paint and varnish. They are bound in tin, and are usually chisel pointed.

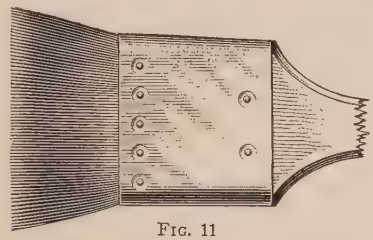

FIG. 11

89. Camel's-Hair Color Brushes.—Camel's-hair color brushes, one form of which is shown in Fig. 11, are always made of squirrel's hair, which is very soft. The ends are square and the brushes are bound in tin. Their principal use is found in applying flat colors ground in japan and light as to weight, such as drop black, and in fact, all colors except those containing large quantities of lead or other heavy pigments.

USING THE BRUSH

90. Holding the Brush.—Ordinarily the brush is held in much the same manner as one would hold a pen when writing; that is, it would be grasped between the thumb and the index

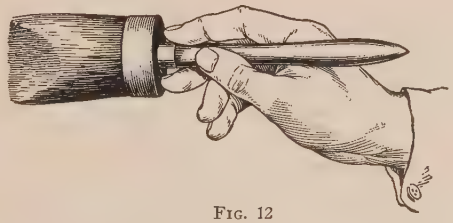

FIG. 12

and middle fingers, as illustrated in Fig. 12, with the tips of the fingers resting lightly against the head of the brush. This is the correct method. The beginner will find it very tiring at first, and it will cramp his hand severely; but perseverance

will conquer the fatigue, and eventually he will not mind it at all. Until he becomes accustomed to the correct position he will be tempted to take the short and more comfortable hold shown in Fig. 13; but he should not yield, for the position here

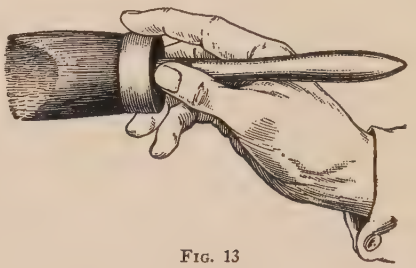

FIG. 13

shown is not the proper one to employ. If the operator is working on a ceiling or other overhead work, or is painting a surface below the level of his waist, the brush should be held as shown in Fig. 14.

91. Method of Using Brush.—Almost every one is able, in a more or less satisfactory manner, to apply paint; but to do so correctly, economically, and in satisfying quantities requires considerable practice and experience. A peculiar twisting wrist motion is necessary, and a certain graceful movement distinguishes the seasoned workman from the amateur or the beginner. Paint is almost invariably applied and laid

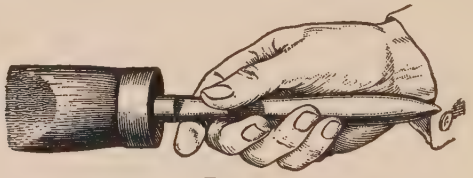

FIG. 14

off brushful by brushful. In other words, as the material is spread on the surface, the work is finished and laid off smoothly before another dip is made. It is carefully brushed out, and as a rule is applied sparingly.

Quite the reverse is true of varnish, which is generally flowed on over as much surface as the operator feels he is able

to handle before he begins to lay it off evenly and with the utmost care, to guard against runs and sags. Whether paint or varnish is used, however, the spreading is accomplished by bearing heavily on the brush, using the heel, while the finishing strokes consist in going lightly over the surface with the tip of a comparatively empty brush.

92. Care of Brushes.—As a rule, brushes are kept in a vessel of suitable size to accommodate the various kinds, known as a *keeper*. One form is shown in Fig. 15. A mixture composed of equal parts of raw linseed oil and turpentine is put into the keeper and the brushes are suspended in it by the handles, in such a manner that the bristle portions are completely covered by the liquid, but not allowed to touch the bottom of the vessel, as that would bend the bristles and spoil the brush. For obvious reasons, brushes used for spreading paint are never hung in the same keeper with brushes used for varnishing, or vice versa.

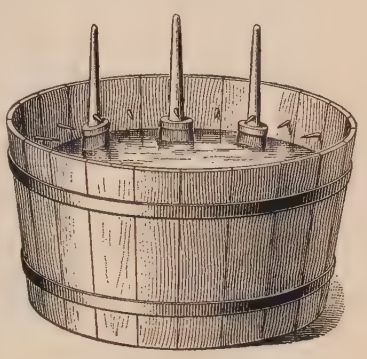

FIG. 15

When brushes have been in the keeper for a time, they must be carefully washed in turpentine before being used. Benzine or gasoline must not be used for washing out such brushes, because, in the case of varnish brushes, it curdles the varnish and causes the brushes to become *lousy,* as painters say. A set of fine brushes used only for finishing or other high-class varnishing is best taken care of by having a separate keeper for the brushes and suspending them in the kind of varnish in which they are being used daily. In this case the keeper must be kept covered, so as to exclude all dirt and particles of dust. Brushes used exclusively for painting are sometimes suspended in water. This, however, has a tendency to soften the bristles and water should not be used with new brushes that already are more flexible than is required for general work.

GRAINING TOOLS

93. Graining.—The art of graining is really a specialty and is considered a distinct branch of the painting trade. It consists in imitating the natural veining and curl of woods and is done by first applying a solid ground color, on which, when thoroughly dry, the grainer practices his art of imitating the particular wood desired, different ground colors being

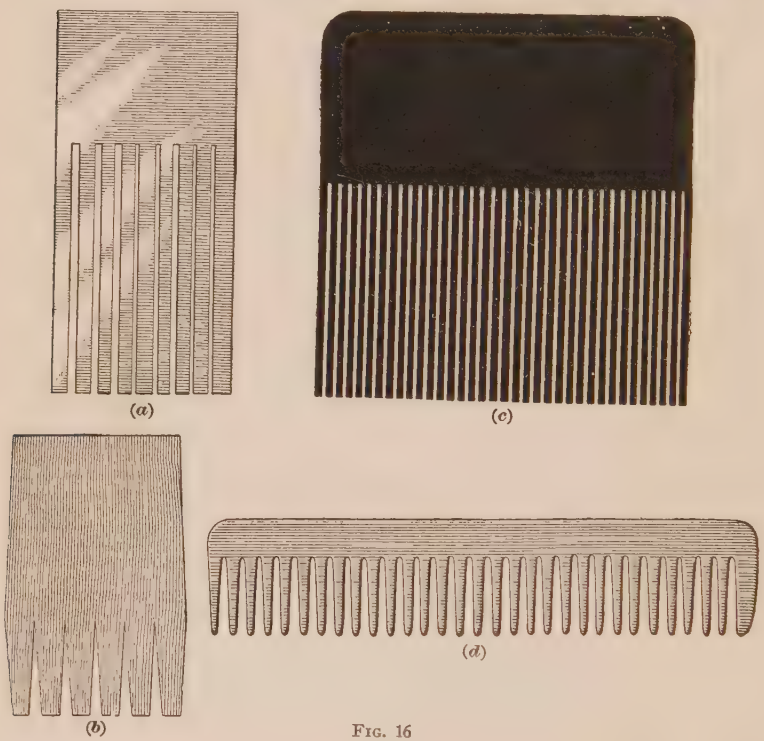

FIG. 16

required for the various woods to be imitated. Nothing more than a general outline may be given as to how the different operations are performed, continued study and direct application being the principal requirements if success is to be attained. Most graining is done with oil colors, although frequently, for certain classes of work, distemper or water colors

are preferred and used. Brief mention of the principal tools and materials required for graining purposes will be made.

94. Combs.—Combs, as shown in Fig. 16 (*a*) to (*d*), are tools usually made of metal, leather, or rubber, with which the straight or wavy grain of certain kinds of wood, such as oak and ash, is imitated. A proper ground having been provided,

FIG. 17

the graining color is applied with a brush and portions of it are immediately scraped off with combs or wiped away with rags, as may be required to imitate the desired wood. The combs come in sets and vary as to width and coarseness of teeth.

95. Graining Brushes.—Where the veins are few and far apart, the color used in graining is applied in streaks instead of a solid coat and for this purpose a number of brushes, called *shaders,* are used. Fig. 17 shows a large shader, which is nothing more than a camel's-hair or sable brush. Many different sizes and lengths are required.

The *pencil overgrainer,* shown in Fig. 18, consists of a number of camel's-hair pencils mounted on a broad, wooden or tin handle and used to mark the parallel grain of various woods.

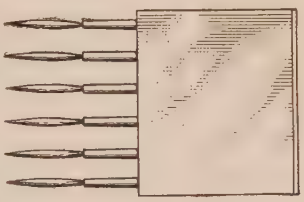

FIG. 18

The *mottler,* shown in Fig. 19, is used to produce a peculiar mottled appearance found in many hard woods, such as mahogany, satinwood, maple, walnut, etc.

The *dabber,* Fig. 20, is required where the blending of one tone into another is desired. It is cut off square on the end and is used to remove and replace small particles of color, thereby producing a soft mottled or graded effect of one ground running into another. It is sometimes referred to as a *blender.*

The *blender,* shown in Fig. 21, is the most indispensable tool of the grainer. It is of badger's hair, and with it are obtained

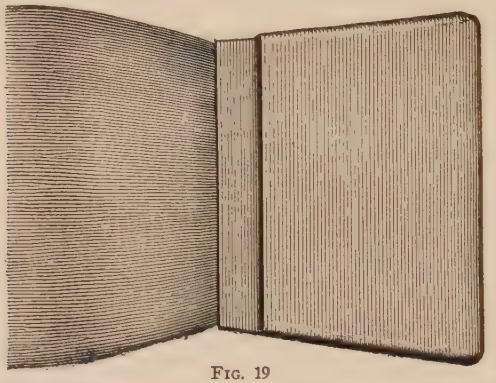

Fig. 19

the beautiful soft blends and delicate shades at times so essential with the work.

The *flat stippler,* shown in Fig. 22, is used by the grainer in imitating the pores of the wood. The graining color is applied

Fig. 20

Fig. 21

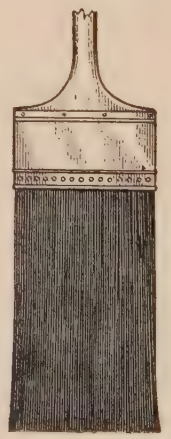

Fig. 22

with a large brush and the entire surface is stippled with the flat side of the stippler.

MISCELLANEOUS TOOLS

96. Putty Knife.—Next to brushes, the tool most extensively used by the painter is the putty knife, shown in Fig. 23. With it he fills up nail holes and other depressions in the surface to be painted. It should be semielastic and not too stiff. The usual width is 1½ inches and the end is square, as shown.

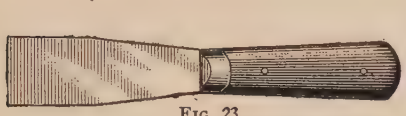

FIG. 23

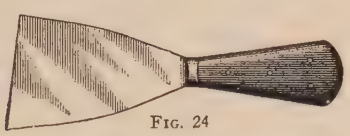

FIG. 24

97. Glazing Knife.—The glazing knife, sometimes referred to as the *plastering knife,* is illustrated in Fig. 24. It will be found useful in all widths from 2 inches to 4 inches, and like the putty knife, it should be elastic. It is used for the purpose of leveling up an uneven surface with glazing putty or plaster, which is a mixture heavier than putty, and too stiff to permit of its being applied with a brush.

SPRAY METHOD OF PAINTING

98. Description.—The spray method of applying paint to surfaces consists of forcing a spray of paint against a surface so that the paint will adhere to and cover the surface. The paint is atomized and sprayed by means of compressed air, which is furnished from a tank into which it has been forced by means of a gasoline or electric pump. The paint is drawn from another tank. The compressed air and the paint both come from the tanks through sections of hose that come together in the nozzle from which the paint is sprayed. The nozzle is like a pistol, and the flow of air and paint is regulated by the trigger. The nozzle is sometimes provided with an extension that enables the painter to reach 12 or 15 feet away. This makes it possible to do without scaffolds, ladders, etc., for work of moderate height.

The use of the spraying machine enables one man to do the work of eight or ten men working with the brush. Spraying

also saves the cost of brushes, especially when the paint is applied to rough surfaces of brick, concrete, or stone. One man can cover with a spraying device from 5,000 to 10,000 square feet in 8 hours.

There is a waste of paint due to the use of the spraying machine when it is compared with the brush, but the saving

Fig. 25

of labor more than offsets this loss. The loss of paint is about 10 to 15 per cent.

The spray is used mostly on rough work such as the interiors of mills and factories where uniform colors are used. Any kind of thin paint or liquid can be successfully applied by the

spray machine, and on large surfaces it can be applied economically. It is easy to get the paint into difficult corners where it would be difficult to use a brush. For fine work the brush must be used, also when it is necessary to brush out the paint or to flow it on.

LADDERS, SCAFFOLDS, AND TRESTLES

99. Purpose.—Ladders, scaffolds, trestles, and other similar devices are used to enable the painter to reach surfaces that cannot be reached from the floor or from the ground. Painters are frequently obliged to paint the walls and cornices of tall structures and must work from scaffolds. A painter should take every precaution to obtain the best scaffolds, and

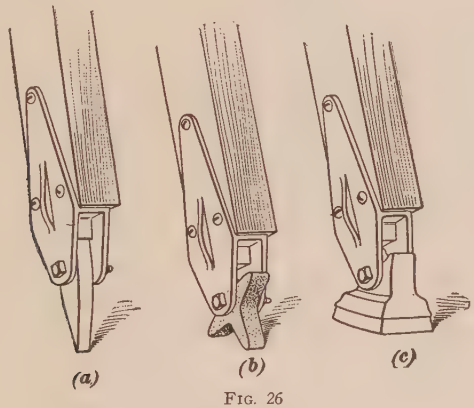

FIG. 26

should understand thoroughly how to manage them, as mistakes in these matters may lead to serious accidents or loss of life. Working from ladders is also risky at times, and care in the selection of ladders, as well as in supporting them, is very necessary.

In estimating the cost of painting a structure the cost of providing and erecting scaffolds is sometimes an important item in the cost of the work. Painting a very high ceiling may call for an extensive scaffold that may cost more than the painting of the ceiling itself. The cost of removing the scaffold is an additional item.

Whenever scaffolding, ladders, etc., are used the matters of safety of the workmen and the cost of the erection and handling should always be carefully considered.

100. Ladders.—Ladders of various lengths are required by a painter. The customary lengths are 8, 10, 12, 14, 16, 18,

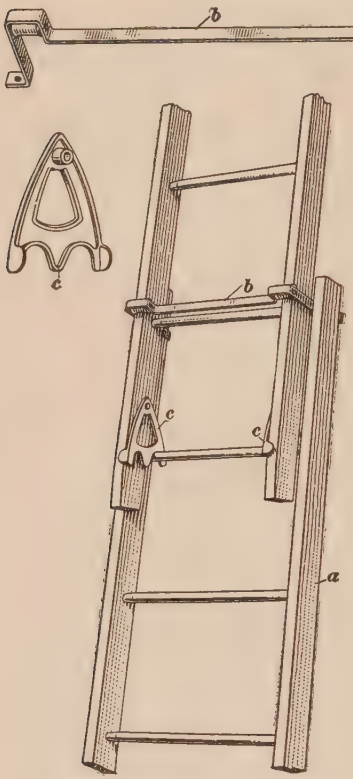

Fig. 27

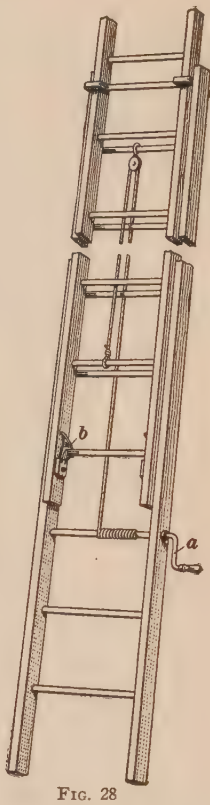

Fig. 28

and 20 feet. The sides of the ladders are made of spruce, Norway pine, or Oregon pine, and the rungs of hickory, ash or oak. The rungs are mortised into the sides and fastened with pins or nails. The customary form of ladder is shown in Fig. 25. Ladders can be used to reach the surfaces of low buildings that are to be painted, thus avoiding the use of scaffolds.

Ladders are frequently fitted with devices to prevent the foot of the ladder from slipping. The more common devices are steel points shown in Fig. 26 (*a*), carborundum points in (*b*), or friction grips in (*c*). The steel points are used on rough wooden floors or on earth. The carborundum points are for use on concrete floors, and the friction grips on smooth wooden floors.

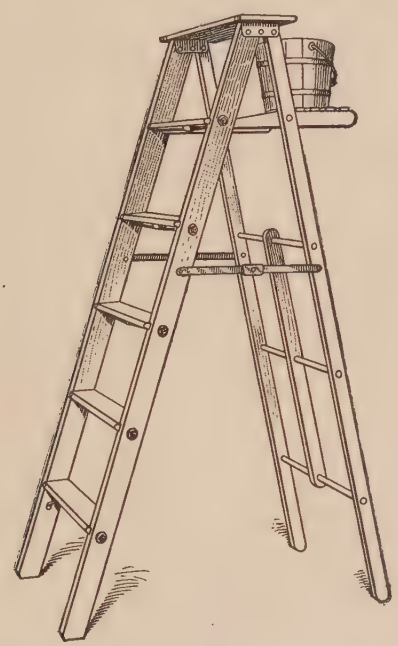

Fig. 29

101. Extension Ladders.—A ladder made of two or more sections arranged to fit together to make a ladder adjustable to any length within the limits of the sections is known as an extension ladder. Such a ladder is shown in Fig. 27. The lower section *a* has a device at *b* to hold the sections together with a slip joint, while hooks *c* on the lower end of the upper section are designed to fit any rung of the ladder in the lower section, making a ladder of the desired length. These hooks are automatic in action, so as to hold firmly and not slip or become detached from the rung. Sometimes a pulley or

windlass device, as at *a* in Fig. 28, is used to raise the upper section. The lock *b* holds the upper section in place after it is raised the desired height. The ladders are from 16 to 50 feet long for the two sections. Either section may be used separately if desired.

102. Step Ladders.—Step ladders, having flat steps from 4 to 6 inches wide in place of rungs, as shown in Fig. 29, are made in various sizes from 4 to 10 feet high. Some styles have a shelf on which a pot of paint may be placed, as is shown in the figure.

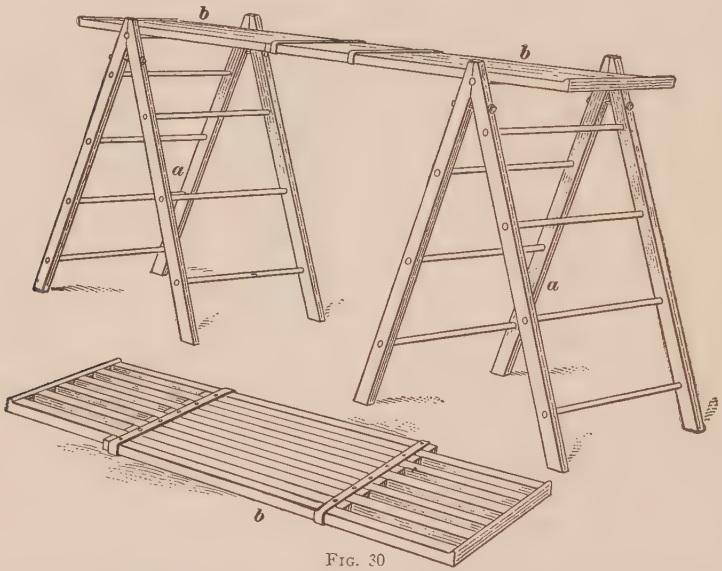

FIG. 30

103. Trestles.—Common trestles are shown in Fig. 30 at *a*. These trestles are called **A** trestles, and are used to support boards *b* in forming low scaffolds. An extension trestle is shown in Fig. 31, which is used for higher scaffolds. Extension trestles are made of both wood and metal, and support the platform at any height up to 16 feet.

104. Standards.—A painter's standard is shown in Fig. 32. At *a* are standards through which pins *b* are thrust to support planks *c*, which carry the platform *d*.

Horses and trestles are used principally on interior work, in connection with planks, so that the painters can walk on the scaffold.

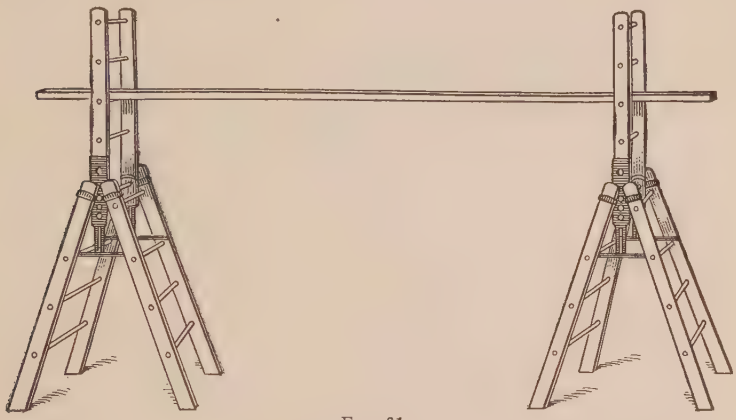

FIG. 31

105. Scaffold Planks.—Scaffold planks are usually about $1\frac{1}{4}$ inches thick and 10 inches wide, free from knots or weak

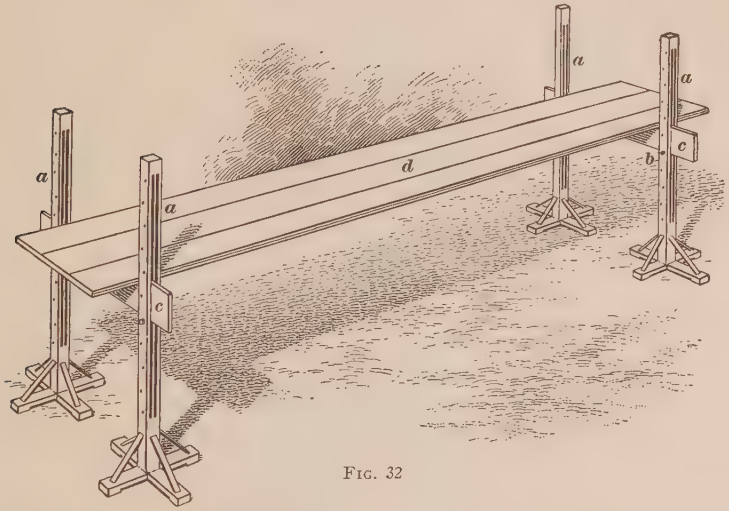

FIG. 32

spots that would decrease the strength. The planks are from 8 to 16 feet long, so as to fit in rooms of various sizes. The

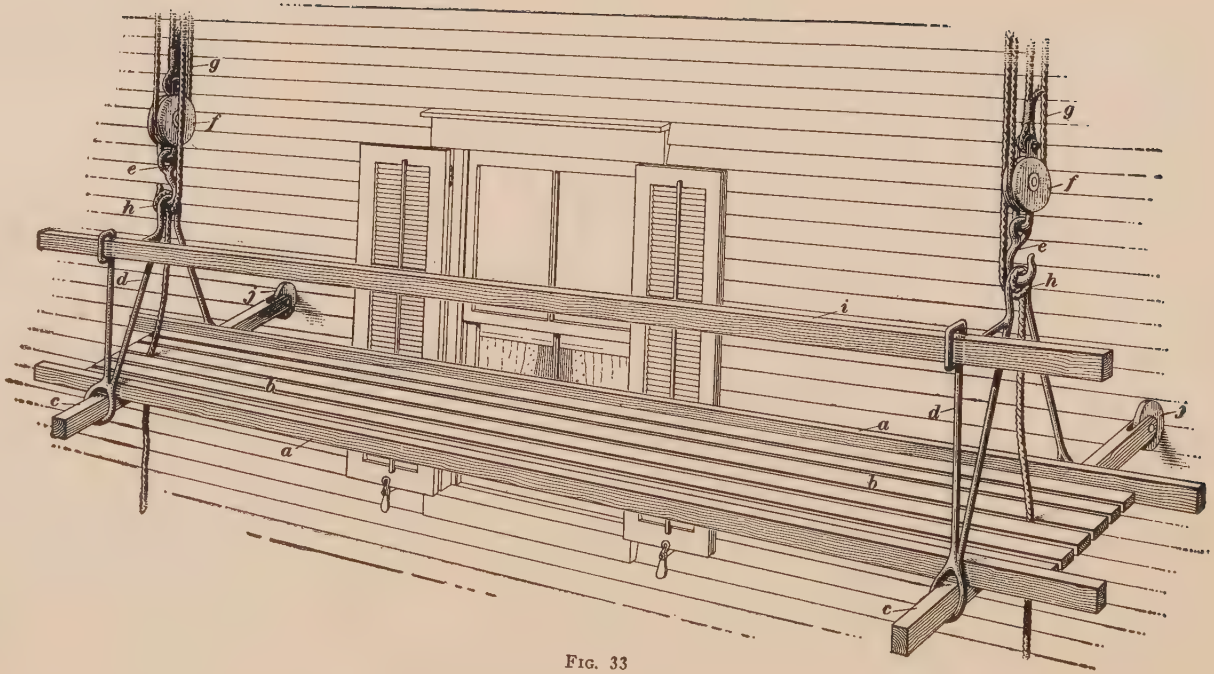

Fig. 33

ends of scaffold planks are usually bound with strap iron to prevent splitting, and holes are usually bored near the ends, through which bolts may be slipped to prevent the planks from slipping off the supports.

106. Swing Scaffolds.—Outside walls may be painted from ladders, but this requires constant changing, and entails the risk of the painter's endeavoring to reach too far rather than move the ladder. Swing scaffolds or staging is used preferably when painting walls or surfaces of greater height than can be reached easily by ladders. These devices are hoisted up and down against the face of the wall that is to be painted and afford easy access to the surfaces.

A swinging scaffold is shown in Fig. 33 and consists of a ladder *a* supporting planking *b*. Both the ladder and the planking must be made strong enough to support safely the weight of two painters. It should be light enough to be easily raised or lowered by the efforts of two men. The ends of the ladder *a* are supported on bars *c*, which are supported upon iron brackets or stirrups *d*. The bracket is suspended from the roof or cornice above on the hook *e*, the block *f*, and the ropes *g*. When the scaffold has been raised or lowered to the proper point the free part of the rope is fastened by hitching it around the point of the hook as at *h*. A guard-rail *i* runs through two eyes in the bracket and prevents workmen from backing off the platform *b*. Wheels *j* are fitted to the ends of the bars *c* so that they will move smoothly up and down against the wall.

APPLICATION OF PAINT

PAINTING EXTERIOR WOODWORK

107. Woods Commonly Used.—The woods commonly used for exterior finish are white pine, redwood, white and red cedar, cypress, Douglas fir, Sitka spruce, and yellow pine.

108. Number of Coats.—Three coats of paint should be applied on new surfaces for exterior woodwork. These coats are known as the priming coat, the body coat, and the finishing coat. On old work, where repainting is necessary, one coat is sometimes enough, especially when the old paint is in good condition. Sometimes the paint seems in good condition, except that it has faded and lost its luster. In such cases a coat of boiled oil, or raw oil with drier, is all that is needed to renew the surface.

109. Thick and Thin Coats.—A thin coat of paint on wood is better than a thick coat. Linseed oil dries by absorbing oxygen from the air, and if a thick coat of paint is applied a skin forms over the surface, beneath which the oil dries very slowly.

110. Time Allowed for Drying.—Plenty of time should be allowed for one coat of paint to dry thoroughly before applying the next coat. Unless this is done, the drying of the upper coat is apt to pull the under coat loose, besides preventing the drying. The time required for drying will depend somewhat on the weather and on the composition of the paint. When driers are added to the paint the time required for the paint to dry is much less than when no driers are used. Two or three weeks' time is frequently allowed for the drying of the priming coat, while the last coat will dry in a week or two, according to the weather.

PREPARATION OF SURFACES

111. New Woodwork.—On new work very little work is required to make the surface satisfactory for the application of the priming coat. If the work has stood for several days, dust may have collected on the door and window heads, and plaster and mortar may have been spattered on the surfaces. All such dirt must be removed, the putty knife and the duster being used. The wood must be clean and dry before applying any paint.

The painter should see that all parts are nailed tightly, and that the nails are set. He should call the attention of the carpenter to any matters that will interfere with making a good job of painting.

112. Knotting.—Any knots or sap streaks that appear on the surface of the wood should have a coat of grain-alcohol shellac, in order to prevent the sap or resin from working through the paint and staining the surface after the paint is applied. This process is called knotting.

PRIMING COAT

113. Composition.—The composition of the priming coat should be similar to that of the succeeding coats, in order that the different coats may unite to form a compact film of paint over the entire surface. The priming coat is mixed a little thinner than the following coats, as the wood is apt to absorb some of the oil. Turpentine is also added to assist the oil to penetrate into the wood, especially in the case of resinous woods.

114. Application of Priming Coat.—The priming coat is applied as a thin coat, and should be well brushed to force it into the pores of the wood. Every particle of exposed woodwork should be painted with this coat, in order to fill the pores of the wood and to form the foundation for the later coats. On a three-coat job the priming coat for the window and door trim, cornice, etc., is the same color as the priming coat for the remainder of the building.

115. Puttying or Stopping.—When the priming coat is dry the nail holes and cracks should be filled with putty. The putty is sometimes colored to match the finishing coat of paint, and must be forced into all holes, cracks, and joints with the putty knife. The surface of the putty should be smoothed off, and left with a slightly bulging surface, as in drying it may shrink a trifle. This process is called puttying or stopping.

SECOND OR BODY COAT

116. Composition.—The second coat of paint is the same composition as the finishing coat, and is intended to form a good wearing surface. It should not be as thin as the priming coat, and should be of the colors in which the building is to be finished.

117. Application.—The second coat should be a little thicker than the priming coat, and should not be brushed out so far. It must hide the surface more than the priming coat, and must present a smooth even finish.

FINISHING COAT

118. Composition.—In a previous article the composition of the several coats is given. The composition of the third, or finishing, coat is similar to the preceding coats. There is less turpentine, however, as it is desirable that the paint dry with a full gloss. The paint is also mixed with the coloring materials necessary to give the finished color to the work.

119. Application of Finishing Coat.—The application of the finishing coat does not differ much from that of the second coat. Care must be observed that all of the surface is covered. It is a good plan to apply the paint for the door and window casings, etc., before the body color is put on. The painter then works up to the edge of the trim color, applying an even coat over the entire surface.

120. Painting the Trim.—All of the trim should have three coats of paint the same in composition as that for the

remainder of the building. The second and third coats, however, are sometimes tinted by the addition of the colors already mentioned. Care is required in mixing the trim color, as, unless the color is mixed evenly through the paint, streaks will appear in the finish work where the color is brushed on. The paint should be well mixed and strained two or more times through cheesecloth, in order to get rid of any lumps of color.

PAINTING PORCH FLOORS

121. The porch floor, if properly laid, has the joints filled with white lead paint. Some of the paint is squeezed out when the boards are driven up tight. This surplus paint must be removed with a putty knife, and all other foreign material, such as plaster, dirt, etc., must be cleaned off. The surface should then be sandpapered lightly, and dusted off ready for the paint.

Porch floors require a priming coat and at least one more coat. Two coats after the priming coat make a better job. It is advisable to let the first and second coats dry hard and to sandpaper each coat before applying the next coat.

122. The following materials and proportions are recommended for floor paint:

First coat: 1 part litharge, 3½ parts white lead, 3½ parts zinc white, thinned with 1 part linseed oil to 3 parts turpentine. The necessary colors and a little Japan drier are then added.

Second coat: 1 part white lead and 1 part zinc white, and the tinting colors. The vehicle should be 1 part good floor varnish and 4 parts turpentine.

Third coat: 1 part white lead, 1 part zinc white, and tinting color, reduced to the required consistency with 1 part turpentine and 3 parts floor varnish.

In case only two coats are to be applied, the second coat is omitted, and the final coat is the same as the third coat just mentioned.

The use of 1 part red lead to 2 parts white lead in the priming coat is recommended to give a hard surface.

Besides laying the joints in lead and oil it is advisable to paint the under side of the porch flooring, before laying, with a paint composed of 66 pounds dry red lead, 34 pounds of white lead in oil, 5 gallons raw linseed oil, 1 gallon of turpentine, and $\frac{1}{4}$ pint of turpentine drier. This painting will prevent the absorption of moisture by the boards, which will tend to prevent blistering and peeling of the paint on the upper surface.

PAINTING WINDOWS

123. Pulley stiles should have two coats of linseed oil containing no pigment. This will protect the wood and at the same time will not become unsightly through being scraped off by the sash. The sash should be oiled or painted on the rubbing edges. The sash is fitted in the frame, and then removed for painting. All the edges can then be painted.

PAINTING DOORS

124. The tops and bottoms of doors should be painted after fitting. This is sometimes omitted to save the labor of taking off the doors; but it is important, as it prevents moisture from entering the wood at those places.

PORCH CEILINGS

125. When the porch ceiling is to be painted, it should first be sandpapered lightly and dusted off. A priming coat is then applied the same as for outside wooden walls. The second and third coats may be the same as for new outside work.

STAINING SHINGLES

126. Ready-Stained Shingles.—Shingles may be purchased already stained in various colors. Such shingles need no further staining except possibly to touch up cut edges where the wood is exposed. Their use saves the time required to stain shingles before laying, and also the time required to give an

extra coat after the shingles are laid, as required by some specifications.

127. Nature of Stains.—Ready-mixed stains for coloring and protecting shingles are manufactured and sold. Most of these stains as well as those mixed by the painter consist of oil-color pigments with linseed oil as a vehicle. Creosote oil is added to give the stains value as a wood preservative.

128. Staining the Shingles.—To get the best results in staining shingles they should be dipped into the stain before being laid, and receive one brush coat after laying. It is necessary to dip the shingles only two-thirds their length in the stain, as less than this much of the shingles is exposed to the weather.

Shingles that are laid before staining should receive not less than two coats of stain. Old shingles will take more stain than new, on account of their greater absorbency.

The covering capacity of stains depends upon the manner in which the stains are used. If brushed on, a gallon will cover 160 square feet one coat, while $1\frac{1}{2}$ gallons will cover the same surface two coats. From $2\frac{1}{4}$ to $2\frac{1}{2}$ gallons is sufficient to dip 1,000 shingles and less than a gallon is enough for an additional brush coat that is applied after the shingles are laid.

When shingle stains are used care should be taken to keep the mixture thoroughly stirred from the bottom, so as to keep the coloring matter in perfect suspension throughout the vehicle.

129. Precautions in Using Creosote Stains.—When rain water from roofs is collected in a cistern, and used for domestic purposes, care should be taken, if creosote stain is used, to prepare the stain so that it will dry quickly after application. The reason of this is that creosote, while not injurious, is unpleasant to the taste. Upon drying rapidly it will, after the first few rains, leave no foreign taste to the water. In fact, whether paint or stain is used on the roof, the first two or three rains should not be, on any account, collected, because in the case of paint, the superfluous color is washed off and contaminates the water; whereas creosote affects the taste.

PAINTING MASONRY SURFACES

130. Kinds of Surfaces.—The masonry surfaces that may be painted or coated are brick, stone, concrete, and stucco, or plaster. Either exterior or interior surfaces may be painted.

131. Object of Painting Masonry.—The object of painting exterior surfaces is to improve the appearance and color, and to prevent the absorption of water by the pores of the material of which the surface is composed.

132. Kinds of Paint.—Exterior masonry surfaces may be painted with oil paints; with paints or coatings composed of cement and water with or without coloring materials; or with special waterproofing and preservative paints, which are generally patented preparations. Some of the paints are colored with mortar colors; whereas others are transparent or colorless. Interior masonry may be painted also with water paints, such as calcimine and similar preparations, since they are not exposed to moisture and rain.

133. Preparation of Surfaces.—Masonry surfaces must be clean, dry, and free from dust, so that the paint can be applied directly to the material of which the wall or ceiling is composed. All traces of efflorescence, mildew, oil, or discoloration should be removed. Gutters and roof connections should be examined to see that there is no leakage of water into the wall that would cause dampness or efflorescence.

Old mortar should be scraped off and the joints in the masonry should be repointed where necessary. Concrete or cement surfaces are often impregnated with alkali, which prevents the adhesion of the paint and tends to destroy the paint. Such surfaces should not be painted for a year or more after being built so that the alkali may be washed out by rains. If it is absolutely necessary to paint the surface immediately, it may first be washed down with a mixture of 20 parts zinc sulphate, and 80 parts water. When the surface has thoroughly dried, paint may be applied. Alkali in the wall is especially fatal to oil paint, as it turns the oil into soap, which will wash off in rains.

Foreign substances on masonry surfaces can be removed by brushing with wire brushes. In some cases where oil paint is to be applied, small spots may be covered with shellac and then painted.

134. Brick Surfaces.—Brick may be painted with lead and oil paints. A priming coat may consist of 100 pounds white lead, 7 gallons raw linseed oil, 1½ pints drier, and 1 gallon turpentine. If boiled oil is used, the drier can be omitted. Coloring may be added as desired.

A good priming coat is composed of 70 pounds of white lead, 30 pounds of red lead, 5 gallons raw oil, 1 pint drier, and ½ gallon turpentine. If boiled oil is used, the drier is omitted.

When the brick is impervious, less oil will be required than when the brick is porous.

The second coat is composed of 100 pounds white lead, 4 gallons linseed oil, 1/3 boiled and 2/3 raw, and 1 pint turpentine.

The third, or finishing, coat should be composed of 100 pounds white lead, 3½ gallons linseed oil, 1/3 boiled and 2/3 raw, and 1 pint turpentine. Suitable coloring matter is added to each coat.

135. The brick may be painted or coated with any of a large number of special paints. Some of these require only one application; whereas, others require more. These paints or coatings usually dry with a dull or flat surface. The directions of the manufacturers must be followed carefully to secure the best results. These paints or coatings must usually be renewed every 3 or 4 years. Colorless waterproofing paints or compounds are often applied to brick and stone work to make the walls waterproof without affecting the natural color of the material.

136. Stone Surfaces.—Stone seldom requires painting, as it is usually impermeable. Some stones, however, disintegrate in some atmospheres, owing to frost, or to gases in the air. Oil paints may be applied in the same manner as on brick walls, except that less oil would be used in the priming coat.

Stone may be waterproofed and preserved by the use of the special paints or coatings already mentioned. There are companies that make a specialty of applying waterproofing and preservative materials.

137. Cement Surfaces.—Surfaces of concrete, cement, and stucco are all more or less porous. The absorption may be stopped by the use of oil paints or by the special coatings already mentioned for brick walls. The methods of application are similar.

138. *Concrete floors* are also painted or treated to resist wear and the tendency to become dusty owing to the wearing of the surface. Special preparations are used which close the pores of the cement, and also harden the surface. Most of these preparations contain a form of iron, which unites with the cement to form a hard and impermeable surface.

PAINTING METAL SURFACES

OBJECTS OF PAINTING

139. Preservation.—Metal work is painted in order to preserve it from the effects of the weather. Iron and steel are subject to corrosion when in contact with air and water. The surfaces must be painted so that water cannot reach the metal. Metal surfaces should also be protected from the action of atmospheric gases, acids, and sea air.

140. Color.—Exposed metal work, such as cornices, gutters, and ornamentation of the building in general, as well as some roof surfaces, must be painted a color in harmony with the rest of the building. In such cases oil paints suitably tinted must be used

PAINTING STRUCTURAL WORK

141. Preparation of Surfaces.—The surfaces of structural steel and iron must be free from scale, grease, rust, and moisture. Scale may be removed by brushing with stiff wire

brushes, and rust by scraping with steel scrapers or by a sand blast. Rust will spread from a center if there is any chance to do so, and paint over such a spot will flake off, exposing the metal to the destroying action of oxygen in the presence of water. Deep-seated rust spots may be removed by heating with a torch. This converts the rust into peroxide of iron, which is harmless and may be brushed off. Grease and oil spots may be removed with benzine. The surface must be dry and clean before any paint is applied, and the paint will adhere better if the metal is moderately warmed.

Surfaces that are not to be painted, such as pin connections, are coated with a thick grease, such as vaseline, or white lead and tallow, to prevent rusting.

142. Number of Coats.—Structural steel should have at least two coats of paint over the entire surfaces. The first coat is usually applied in the shop as soon as the metal is fabricated, and is known as the *shop coat.* A second coat of paint is applied after the steel is erected, and is known as the *field coat.* In cheap work the second coat is omitted. In any case, however, the new rivets, bolts, and scratched places should be painted over.

When structural work is exposed in the finished building, a third coat of any desired color is frequently given the metal. The colors of the different coats vary so that it can readily be seen that all the work has been covered by each coat.

143. Materials.—Red lead and raw linseed oil are considered best for the shop coat, although some prefer white lead and oil. There are also many special paints, the bases of which are such materials as graphite, carbon, and asphalt. These paints should be used according to the directions of the manufacturers. A formula for the first coat of red lead paint is 100 pounds of red lead and $2\frac{1}{2}$ gallons of raw linseed oil.

The second coat is usually a color contrasting with the first coat, so that the inspector can tell at a glance if any places have been omitted. A brilliant color is preferable for the first coat, followed by a more subdued color in the second, such

as the dark gray of graphite paint. A good formula for a second coat of red paint is 100 pounds of red-lead paste, 2§ gallons raw linseed oil, and 12 ounces of lampblack. For a third coat, 100 pounds of red-lead paste, 2§ gallons raw linseed oil, and 10 pounds of lampblack is a satisfactory mixture.

144. Application of Paint.—The first, or shop, coat, is spread rather thin, in order that it may dry quickly, and so facilitate the erection. The second coat is spread on as thick as it will stand without running, so that a thick, tough film is secured, especially where the steel is to be covered with masonry. Bolts, rivet heads, edges, and corners should have an extra coat of paint.

PAINTING ORNAMENTAL IRON WORK

145. Surfaces Covered.—Such work as railings, gratings, bars, fire-escapes, and other outside iron work requires practically the same preparation as structural iron work. In all cases a shop coat should be given before the work is brought to the building, in order that rust may not get a start. As the work is nearly always visible, in some cases prominently so, care must be taken that the surface is cleaned free from scale, rust, grease, etc., that might mar the finished surface. As with structural work, the first coat may be red lead, and the subsequent coats red lead or white lead tinted or colored as desired.

PAINTING TIN WORK

146. Surfaces Covered.—Tin, or tin plate, is used on roofs, decks, conductors, flashings, etc. It is also used in interior work, such as for covering fire-doors, metal ceilings, leaders and stacks for furnaces, etc.

147. Preparation of Surfaces.—All traces of oil, grease, rosin, and other fluxing materials, must be removed. Washing with benzine may be necessary, and rosin may require scraping off to insure a clean surface. The surface should be painted as soon as possible after it is laid.

148. Number of Coats.—The under side of all roofing tin, gutters, and similar work should have a coat of paint before laying, and the exposed surfaces two coats after laying.

149. Materials.—Red lead paint is excellent for the under side of the tin, and for the first coat on the exposed surface. The best practice calls for the oil to be one-third boiled oil and two-thirds raw linseed oil. White lead and oil is also used, as well as the prepared paints that have been mentioned. The finishing coat may be red lead or white lead tinted as desired.

Peeling of paint from a tin roof occurs when the coat of paint next to the tin has lost its elasticity after exposure for many years. The trouble usually develops during a spell of severe cold weather. The unequal contraction of metal and paint, under the influence of low temperature, in combination with the lifeless condition of the paint film next to the smooth tin, brings about the peeling. The old coat in loosening, naturally takes with it the more recently applied coats of paint that are in good condition and have the desired elasticity. Peeling of paint during extremely cold weather will only occur where the priming coat, next to the tin, is dry and brittle. Paint applied more recently to the adjacent portions of the tin will cling to the surface tenaciously. This fact corroborates the fact that elasticity is the life of paint. The liberal use of linseed oil increases elasticity and retards disintegration.

150. Application.—The coats of paint on tin work should be brushed on evenly, so that no spots remain where rusting might start. The surfaces must be clean, dry, and free from foreign matter of any character. Each coat must be dry before the next coat is applied.

151. Repainting.—Tin roofs require repainting as soon as the paint film is broken. This sometimes occurs after a period of cold weather, as above stated. When repainting is required, all loosened paint should be removed from the tin. Two coats of paint are then required, the same as for new work.

PAINTING METAL CEILINGS

152. Metal Ceiling.—Metal ceilings are stamped or rolled from sheets of black iron usually. To prevent rusting between the time of manufacture and placing, the sheets or plates are usually painted on both sides with a priming coat of white lead and oil paint tinted as desired. During the handling and placing some of the paint is scratched off, and the surface becomes more or less soiled.

153. Preparation of Surfaces.—When the work is all in place the surfaces should be cleaned by brushing, or by the use of a stiff wire brush, which will remove all loose dirt, scale, etc., and roughen the surface so that the coats of paint will adhere well. Any grease or oil spots should be washed off with benzine. Nail holes should be filled, and any loose or poor joints made good before painting.

154. Painting.—When the sheets have not been painted at the factory, a coat of white lead with one-half linseed oil and one-half turpentine may be used for the priming coat. This priming coat is applied to both sides of the sheet, so as to prevent rusting. Some painters prefer red lead for the priming coat. The paint should be applied with a brush and well brushed out.

The body coat, following the priming coat, should be a flat-drying paint, the vehicle being half linseed oil and half turpentine. This coat may be tinted as desired, and should be applied with care to cover all the surfaces as evenly as possible.

The finishing coat should have very little oil in it, in order that it may dry flat. It may be tinted in any desired colors. This coat should not have a gloss, as a gloss finish will not distribute the light so well as a flat finish. The last coat may be stippled as the work progresses.

PAINTING GALVANIZED IRON

155. Preparation of Surfaces.—Ordinary paint will not adhere to galvanized iron surfaces without preparation. One method of preparing the surface consists of washing the sur-

face with vinegar before applying the paint. Another is to wash the surface with a solution of $\frac{1}{2}$ ounce each of nitrate of copper, chloride of copper, and sal ammoniac in 1 quart of lukewarm water; when dissolved well, $\frac{1}{2}$ ounce of hydrochloric acid is to be added. The solution is to be kept in a glass or earthen jar, as the chemicals will eat a tin pail. After the mixture has been applied with a wide brush, it should stand until it dries, forming a whitish powder. This powder can be dusted off, leaving the surface ready for paint.

156. Number of Coats.—Not less than two coats of paint should be applied to the exposed surface of galvanized iron. The first coat may be of red lead and oil, or of white lead and oil, or of special paint. The red-lead paint may be in the proportions of 33 pounds of red lead, $\frac{1}{3}$ gallon boiled linseed oil, and $\frac{2}{3}$ gallon raw linseed oil. This coat should stand for at least one week before the finishing, or second, coat is applied. The second, or finishing, coat may be of white lead colored as required. Whenever possible the galvanized iron should be painted on the under side before laying.

PAINTING BLACK IRON

157. Black iron is made into various forms for building purposes, such as plain sheets, corrugated sheets, pressed metal roofing, metal shingles, etc. These materials are used for roofing, siding, gutters, valleys, etc.

As a rule, black-iron sheets are painted in the shop. The plain sheets may be painted by passing through rollers working in a tank of paint. The painted sheets are sometimes corrugated or pressed into the required shapes. When the sheets are delivered on the job unpainted, one coat of paint should be given to their under sides. Red lead, white lead, or any of the special paints mentioned are satisfactory. A priming coat on the exposed surface after the metal is in place may be of white lead or red lead and oil, the same as for galvanized iron. The finishing coat may also be the same, and applied in the same manner as described for other exterior surfaces.

158. As a general rule, no metal should be painted in very cold weather. Some authorities suggest that no metal be painted when the temperature is below 50° F.

159. Steel used for reinforcing concrete is not painted, as it is desired to take advantage of the natural bond between the concrete and the metal. Concrete also is almost impermeable, and the alkaline composition of the concrete preserves the steel.

SANDING PAINTED WORK

160. Definition.—Sanding is the process of applying sand to a newly painted surface for the purpose of obtaining a rough texture resembling stone or plaster. The sand has considerable resistance to wear, and the weather-resisting property of the paint film is thereby increased. To a certain extent the color of the sand affects the color of the surface, particularly if the sand is applied when the paint has partly dried and is still tacky. The sand does not become covered with the paint, but is merely attached to the surface, showing the color of the sand with the background of the color of the paint. If the surface is sanded while the paint is fresh the grains of sand become embedded entirely in the paint, leaving the surface rough but the color of the paint.

161. Where Used.—Sand finish is sometimes applied to metal and wood cornices in order to give them the appearance of solid masonry. When sand is used to imitate stone, the color of the sand as well as the color of the paint should match the color of the stone.

To gutters, conductors, and other metal work may be given the color of the stone work against which they are placed, thus rendering them less conspicuous.

162. Processes.—Work to be sanded is painted as already described. When the last coat is nearly dry, but still tacky or sticky, sand is thrown or blown against the surface. When the paint is dry, another coat of thin paint may be applied and another coating of sand applied. This will make a very rough surface.

A pleasing effect may often be given to the surface by mixing the sand with dry color. By so doing the grains of sand receive a coat of dry paint, and when the sand is applied to the painted surface the effect is sometimes better than can be obtained by the dry sand alone.

In case it is necessary to paint over a sanded surface the loose sand should be brushed off so as to prevent its being picked up by the brush. The surface is then painted and sanded in the same manner as is new work.

PAINTING CANVAS ROOFS AND DECKS

163. Canvas is used for roofs of buildings, and particularly for flat roofs or decks on which there is more or less walking. The canvas is laid or nailed to the roof, and is then wet with water. This causes the canvas to shrink, when it should be painted with a paint composed of white lead and linseed oil. When dry the canvas will be found to have stretched tight, leaving no wrinkles on the surface. Sometimes the canvas is laid in wet paint, and stretched tight as the work progresses. Some manufacturers of canvas roofing recommend special preparations that are painted on the wood roofing, the canvas being laid in these preparations before they dry.

A second coat of white lead and oil colored as desired should be applied to the canvas soon after the first coat is dry. A third coat is recommended, to be tinted or colored as desired. This coat is particularly necessary when there is to be much walking on the roof, as in the case of balconies.

Some authorities recommend that a layer of building paper be spread over the wood roofing before the canvas is laid, in order that the canvas may not stick to the wood when laid. Some recommend metallic paints for canvas roofing. Venetian red, mineral brown, and ocher, in connection with lampblack, are recommended when a dark color is not objectionable. The vehicle in any case should be linseed oil, with only a very small amount of drier added.

INTERIOR PAINTING

INTRODUCTION

164. Purposes of Painting.—The painting of the interior surfaces of the building is done largely for decoration and ornamentation, to give a pleasing appearance, and change the natural colors of the finishing materials in conformity with some desirable color scheme. To a degree painting preserves the woodwork from moisture, prevents the accumulation of dust and dirt in the pores of the wood, and hides nail heads and defects of the woodwork. The white finish of plastered walls quickly becomes soiled, even when its original color is satisfactory, and painting or papering is necessary.

165. Surfaces Painted.—The entire interior woodwork of the room may be painted, including the trim, sash, doors, floors, and any built-in woodwork, such as columns, mantels, sideboards, etc. For this purpose oil paints are most generally used. The plastered walls and ceilings may be painted any desired color or tint. Usually a water paint is used for this purpose, although oil paint is equally satisfactory. Sometimes the plastered surfaces are allowed to stand several months before painting. This is more advisable with lime plaster than with gypsum plasters, as it allows the unslaked particles in the lime to slake before painting, and also permits the air to penetrate the lime and harden it.

166. Inspection of Surfaces.—Before any interior painting is done, the surfaces should be inspected to make sure that they are finished, that they are clean and dry and ready for the application of the paint.

PAINTING INTERIOR WOODWORK

PRELIMINARY REMARKS

167. Woods Used.—The woods principally used for interior trim to be painted are soft woods, such as white pine, Southern pine, fir, redwood, poplar, and cypress. The hard woods such as birch and gum take paint well, but other hardwoods are more often finished with varnish, which brings out the grain, color, and figure of the wood.

168. Materials Used.—Interior painting on woodwork requires the use of white lead, zinc white, linseed oil, turpentine, and colors, etc., or practically the same materials as have been described for exterior painting. The proportions and methods of application vary somewhat, as will be seen from the suggested proportions in Table I.

169. Back-Painting.—Back-painting is the process of painting the backs of pieces of trim, base, etc., that are not visible in the finished work. This woodwork comes in contact with masonry surfaces, plaster, and the like, and is apt to absorb moisture that will cause swelling and warping of the wood, and produce cracks, checks, and other defects in the finished work. These troubles may be largely prevented by painting the backs of the pieces. Almost any left-over oil paint is suitable for this work. When new paint is to be used or mixed, the use of red lead is desirable, as a harder and more impervious coating is obtained. This painting should be done several days before the work is to be erected, so that the paint may be dry before the carpenters handle the trim.

170. Preparation of the Surfaces.—Usually the millwork or interior woodwork comes to the job ready for finishing. Handling and nailing it in place, however, may mar the surface, or dampness may raise the grain. Before painting, therefore, all rough spots should be sandpapered smooth, and all nail heads should be at least $\frac{1}{16}$ inch below the surface of the wood.

All knots, sap, sap streaks, or similar defects that may appear in the finished surface should be treated so as to prevent the sap from discoloring the paint. This process is called *knotting,* and consists usually of applying a thin coat of alcohol shellac over the defects. Sometimes a coat of shellac is given to all of the woodwork, particularly if the wood is of a sappy nature, and where a really fine job is desired.

171. *Stopping,* or *puttying,* is the filling of the nail holes, cracks, joints, etc., with a stiff putty. The putty is made by adding enough whiting to white lead as it comes from the keg to make a thick paste. The addition of a few drops of varnish or japan improves the putty. The putty may also be colored to match the finished paint. Before the wood is puttied, it should have a priming coat of linseed oil paint in order that the oil of the putty may not be absorbed by the wood. As the putty shrinks somewhat in drying, it is left a little higher than the finished surface of the wood. The putty should dry for one or two days, although, as a rule, the next coat is applied immediately after puttying. When the knotting is completed and the putty is hard and dry, the woodwork is sandpapered lightly and dusted off ready for the coat of paint. The woodwork may be wiped with a cloth dampened, but not wet, with a little water or benzine.

172. Number of Coats Required.—Three coats of paint are required for good work on new woodwork, and in fine work a fourth coat is added. Sometimes, however, for cheap work, only two coats are applied.

THE PRIMING COAT

173. Materials.—The objects of the priming coat are to fill the pores of the wood and to form a base to receive the subsequent coats.

The priming coat may be composed of white lead, oil, turpentine, and drier, as suggested in Table I. Some painters prefer to use about 1/3 red lead and 2/3 white lead, claiming that this makes a harder coat. The paint should be mixed the

day preceding the painting, and should be strained through cheesecloth to remove all lumps, skins, etc. It may be tinted to match the finished work. The composition should be the same, practically, as the later coats, in order that the different coats may unite to form a single, compact, impervious film on the wood.

174. Priming with left-over material is not a good thing to do. The priming coat is the foundation, and must cling to the wood and support the succeeding coats. The use of ocher in the priming coat is not advisable, as it is seldom ground as fine as white lead or zinc white, and so will not penetrate the pores of the wood. The use of more turpentine in the priming coat than in the later coats will aid in the penetration of the paint, and the thin coat of paint will permit any moisture to evaporate through it.

175. Application.—The paint is applied by strokes parallel with the grain of the wood. Two or three light strokes near the end of a board will transfer most of the paint to the board, reducing the chance of spattering the paint about. The paint is then spread as far as it will go, beginning at the end of the board. Successive brushfuls are applied until the board has an even film over it. Both sides of the brush are used, an even pressure being kept on the surface.

The painted surface is then "laid off"; that is, the whole surface is covered with light swift strokes that smooth up all brush marks, joints, and laps. At this time any thin spots, skips, or "holidays," are covered. Long smooth pieces, such as door and window casings, are finished by drawing the brush the full length of the piece, so that there are no brush marks or breaks in the surface.

The brush is held constantly at right angles to the surface being painted, only the ends of the brush touching the wood. In this manner the paint is forced into the pores of the wood, and is distributed evenly. When the brush is held obliquely to the work, the paint is left in thick masses where it is first applied, or at one side of the stroke. The paint must be applied evenly and brushed out to a thin, even film covering the

wood completely, but not leaving enough paint to run into ridges or waves. Neither should it be stretched out so that an insufficient coat is applied. The woodwork should appear wet, not merely moistened. When only two coats are applied, the first coat should be a little thicker than when three or four coats are to be applied.

176. Drying.—The priming coat will require at least 2 days to dry thoroughly. The drying is aided by plenty of ventilation in the room, particularly in moist, rainy weather. In winter the rooms should be warmed to a moderate temperature, but even in the coldest weather, ventilation is more important than heat.

When dry, the primed surface is lightly sanded, so as to leave a slightly roughened surface, and to remove any paint nibs that may stand out from the surface. Then, when dusted, the work is ready for the next coat.

THE SECOND COAT

177. Composition.—The composition of the second coat, known also as the *body* or *intermediate* coat, is suggested in Table I. This coat is colored to match the finishing coat, and is applied in the same manner as the priming coat. As the second coat is intended to hide the surface better, less turpentine is used in this coat, so that it will naturally be a little thicker, and thus form a heavier film on the surface.

The second coat will need about the same length of time in which to dry as the first coat, and a moderate use of a drier is permissible. When thoroughly dry, the work is sandpapered lightly, enough to take off any gloss or rough specks. When dusted off the work is ready for the third and finishing coat.

THIRD COAT

178. The third, or finishing, coat may have the proportions given in Table I. The exact color desired should be produced, and a sufficient quantity mixed to cover all the wood-

work. Unless this is done the color may not be the same in the successive batches.

The greatest care must be used in applying the finishing coat, and more time taken in applying it. If a high gloss is desired it may be secured by using varnish for a part of the oil or by using very little turpentine and more oil. When a dull or semigloss finish is desired, it may be secured by the use of more turpentine and less oil. There are oils on the market known as flatting oils, which will give a dull surface, and these oils can be substituted for the linseed oil shown in the formula. The full gloss is more easily kept clean, does not show finger marks, and usually is more durable. A semigloss, eggshell, or satin, finish is considered more beautiful by many, and is practically as serviceable as the full gloss. A dead-flat finish paint, while attractive, soils easily, shows finger marks plainly, and requires considerable care to keep clean.

179. *Prepared,* or *ready-mixed,* paints may be used on interior woodwork instead of the mixtures suggested. In every case the procedure is practically the same as with lead and oil paints, except as the manufacturer's directions may suggest special treatment to obtain special results. Prepared paints are made for the full-gloss as well as for the semigloss and dead-flat finishes.

A dull, or eggshell, gloss may be secured by rubbing the surface with pumice stone and water until the desired finish is obtained.

PAINTING FLOORS

180. General.—Wood floors are painted when it is desired to follow out some color scheme, or when the wood used is not suitable for a natural finish. The durability of the finish on floors is most important, as the floor is subject to hard service and wear. It must also be washed and cleaned at frequent intervals, and the paint must stand this treatment. Soft woods, such as pine, hemlock, and poplar, lack grain and color that are suitable for natural finish, and floors of those woods are usually painted or grained to represent other woods. New

floors of oak, ash, maple or Southern pine may be painted if desired, but varnishing or waxing, as described in another article, will usually give a more attractive finish.

It is necessary to select and use proper materials to secure a successful job. The priming coat must anchor firmly to the wood, it must dry thoroughly before the succeeding coats are applied, and the finish coat must be hard before the floor is used.

181. Colors Used.—Painted floors should be of colors that do not readily show soiling, scratches, or dust. Preferably the colors should be neutral in tone, so as to blend with rugs or draperies. Personal taste, exposure to sunlight, and harmony with the adjacent colors are factors that determine the color chosen.

182. Preparation of the Surfaces.—Soft wood floors often open up at the joints, and the cracks should be stopped with a putty such as is used for interior woodwork. Larger cracks may be filled with the same material containing sawdust, or with a putty made of plaster of Paris and floor varnish. Some painters prefer to do the stopping after the priming coat is applied. Any knots or sap must be treated with shellac, the same as for other woodwork. The floor should be examined before painting to see that it is firm and solid, with no loose ends. The surface is then sandpapered and cleaned, and is then ready for the priming coat.

183. Number of Coats.—At least three coats of paint should be applied for good work, and in many cases a fourth is applied. When four coats are used, the second and third coats are similar in composition and application, but are brushed out somewhat thinner than when only one intermediate coat is used.

184. Priming Coat.—For soft woods, the priming coat may be composed of 100 pounds white lead, 6 to 7 gallons of raw linseed oil, 1 gallon turpentine, and 1½ pints of turpentine drier, colored to match the finished work. Instead of all white lead, ⅓ zinc white may be used. Some painters recommend

30 to 35 pounds of red lead and 65 to 70 pounds of white lead instead of all white lead. The red lead makes a hard surface, and the larger quantity of white lead tones the mixture down to a pink tint. This tint may be modified so as to approximate the finished color of the floor.

For hard woods more turpentine and less oil and drier are recommended, as most hardwoods are less absorbent than soft woods, and will allow the turpentine to penetrate more readily than the oil.

185. On account of the larger surface of the floor, the paint is applied in a little different manner than for other wood finish. No attention is paid to the separate boards, but a small square is first painted, the strokes first running with the grain, the paint being rubbed in well. The painted surface is then brushed across the grain, the process being called crossing, and is then laid off carefully the length of the grain over the square painted. Succeeding squares or portions lap over the edges of the preceding squares, care being taken that an even film is left on the floor, and that brushmarks do not show. Plenty of time must be allowed for the priming coat to dry before applying the intermediate coat. From 4 to 6 days is usually sufficient. If stopping and crack filling has not been done before the priming, it should be done as soon as the priming coat is dry.

186. Intermediate Coat.—The second, or intermediate, coat for both soft and hardwoods may be mixed in the proportion of 100 pounds white lead, 1¼ gallons raw linseed oil, 1¼ gallons turpentine, and 1 pint turpentine drier, with suitable color. This coat, like the priming coat, is vigorously brushed out so as to cover thoroughly and evenly, but as thin as possible without being stretched too much. A coat of this composition will dry with a flat or dull surface, which will take the succeeding coat well. When four coats are used, the third coat is the same as the second coat just described.

187. Finishing Coat.—Whether three or four coats are used, and on both soft and hardwood, the finishing coat had best be composed of 80 pounds white lead, 20 pounds zinc

white, 3 gallons raw linseed oil, $\frac{1}{4}$ gallon turpentine, and $1\frac{1}{3}$ pints drier, with the necessary color. When a high gloss is desired, a portion of the oil, from 1 pint to $\frac{1}{2}$ gallon, may be replaced with good floor varnish, and the drier may be omitted. This will give a brilliant and lasting finish.

The finishing coat is applied in the same manner as the preceding coats. When varnish is used as a vehicle, the paint will not stand as much brushing out.

188. Sometimes the floors are to be varnished. In such cases the first coat of paint may be mixed with white lead, turpentine, and a very little boiled linseed oil. The second coat should be $\frac{3}{4}$ white lead, $\frac{1}{4}$ zinc white, with color and turpentine, but no oil except that which is in the lead. This will dry flat. Two coats of good floor varnish will form a finish with a high gloss, that may be waxed if desired.

189. Ready-Mixed Paints.—Ready-mixed floor paints may be used if desired. As a rule, with such paints, the priming coat should have considerable turpentine added, the intermediate coat a very little turpentine, and the finishing coat used without any additional material. Should a higher gloss be desired, a little floor varnish may usually be added without affecting the working qualities of the paint.

190. Repainting.—An old floor that needs repainting is in about the same condition as a new hardwood floor. The priming coat will, therefore, be the same as described in Table I for new hardwood floors. The succeeding coats will be the same as for new work.

ENAMELING

191. Definition.—Enamel is a paint in which varnish is the vehicle. The pigment used is generally white lead and zinc white, with the addition of such colors as may be desired. In some cases the painter mixes his own enamel, while in others he uses enamel prepared by the manufacturer. Enamel is not generally used for exterior work, but there is no reason why it should not be so used, except that it is more expensive as to

materials and labor. As a rule, enamels are made in light colors or tints, but they may be made any desired color by the use of suitable pigments.

192. Where Used.—Enamels are used principally for interior work on soft woods, such as pine and poplar. Some hardwoods, such as birch, beech, and gum, take enamel well, and pieces having poorer grain and figure are frequently used for this finish.

Enamel finish is used largely in the woodwork of kitchens, pantries, bathrooms, etc., where the woodwork and walls are subject to frequent cleaning. It is also used when the finest and most delicate effects are desired. Like paints, enamels can be used to carry out any desired color scheme.

193. Preparation of Surface.—The woodwork is prepared for enamel exactly the same as for oil paint. Knotting and stopping must be carefully done, and a coat of thin shellac over the entire surface is desirable. When the stopping is dry the surface is sandpapered lightly, or rubbed down with steel wool, to make a smooth surface.

194. Number of Coats.—The cheapest enamel finish consists of two coats of paint and one of enamel. A high-class durable finish may be obtained by the application of two coats of paint, one of paint with a little enamel, and two coats of enamel, as described in the following articles.

195. First Coat.—The first, or priming, coat should be composed of 100 pounds white lead, 3 gallons raw linseed oil, 4 gallons turpentine, 1½ pints Japan drier. This coat should be brushed well into the wood, and allowed to dry at least 24 hours, preferably longer. When dry, the work should be inspected to see that all nail holes and cracks are stopped, then sandpapered or rubbed lightly and all the dust wiped from the surface.

196. Second Coat.—The second coat should be mixed in the proportions of 100 pounds white lead, 1½ gallons raw linseed oil, 1½ gallons turpentine, and 1 pint Japan drier. This

coat, like the priming, should be brushed out smoothly, and allowed to dry at least 24 hours. When dry, it is sandpapered lightly, and the dust wiped off with a soft cloth.

197. Third Coat.—The third coat should be mixed in the proportion of 50 pounds white lead, 50 pounds zinc white, 2½ gallons turpentine, and 2 pints white enamel. This coat should be flowed on as smoothly as possible, but not so thick that it will run on the surface. This coat will dry rather quickly, but at least 24 hours must be allowed before sandpapering lightly. A chamois skin is excellent for wiping off the dust.

198. Fourth Coat.—The fourth coat consists of enamel as it comes from the manufacturer, except that 1 pint of turpentine is added to each gallon of enamel. A temperature of 70° is necessary to cause the enamel to flow smoothly under the brush. At least 48 hours should be allowed for this coat to dry, and a longer time is better. When perfectly dry, this coat is rubbed down with fine sandpaper, steel wool, or horse hair, to remove any dust and specks in the surface. The surface is then cleaned as before, the greatest care being taken to secure a perfect surface.

199. Fifth Coat.—The fifth coat is the enamel as it comes from the can. The temperature should be at least 70°, and the coat brushed evenly over the surface. Not more than a square foot can be laid off at a time, as the enamel sets quickly. The work must be finished up as it goes along, as it cannot be touched after it begins to set. Good ventilation is necessary for even and satisfactory setting, but direct draughts of air are to be avoided on account of the presence of dust.

200. Colored Enamel Finish.—When the enamel finish is to be left in the full gloss, colors ground in oil may be used, the under coats as well as the finish coat being tinted. When the enamel is to have a rubbed or flat finish, the color should be ground in Japan. The color is thinned with a little turpentine, and strained through cloth before it is added to the enamel.

201. Rubbed Enamel Finish.—A dull or satin finish on enamel may be obtained by using enamel prepared by the manufacturer to dry with that finish. A better way, however, is to use the full-gloss enamel, and remove the gloss by the use of pumice stone and oil or water.

Dry powdered pumice stone is mixed with a non-drying oil, such as automobile engine oil, to a thin consistency. A felt or heavy wool pad 1 inch thick is wrapped around a block of wood and dipped into the mixture. The surface is then rubbed lightly and evenly until the desired result is obtained. Care must be taken to avoid rubbing through the enamel, especially at edges and corners. It is best to rub with the grain of the wood.

The enamel surface may also be rubbed with pumice and water, or by a damp pad dipped in the dry pumice. The enamel must be kept wet during the rubbing.

When the desired result is obtained, the surface is washed clean with a cloth dampened with benzine, when oil is used, and with clean water when water is used in the rubbing.

GRAINING

202. Definition.—Graining is painting in imitation of the grain of different woods. The painter endeavors to make a correct picture of the natural grain, figure, and color of certain woods. Graining may be applied to wood, metal, plaster, and other surfaces.

203. Tools.—The tools for graining consist of such devices as brushes, pencils, and combs, as have been described.

204. Number of Coats.—Graining requires the application of two or three coats of paint, followed by the application of a coat that will display the color and grain of the wood to be imitated. One or two coats of varnish are required in addition to make the graining to show to advantage and to protect the surface.

205. Application of Coats.—The ground for the graining consists of two or three coats of good oil paint of the general

color of the wood to be imitated, but somewhat lighter in tone. These coats are mixed to dry without a gloss, and are applied as already described.

When the ground is dry, a coat of transparent color of the proper tint or shade, mixed with turpentine or water, is spread over the surface and allowed to dry partially. The process of handling the surface to imitate the wood is called *overgraining*.

206. Overgraining.—Overgraining requires the use of the various tools already mentioned. These tools are dipped in turpentine or water, according to the vehicle used in the graining coat, and are passed lightly and quickly over the surface, so as to leave untouched, according to the skill and fancy of the grainer, the streaky grains, curls, and knots intended to show in the finished work. The work is then wiped with a cloth to take up the portions of the upper coat which have been dissolved by the turpentine or water, leaving the graining as required, and showing the ground below the lines of the graining. The various lines, eyes, veins, knots, etc., are then touched and retouched until the desired effect is obtained. The skill and practice of the grainer are called into service, and a well-grained piece of work requires a degree of taste, observation, and dexterity that places the grainer's work far above that of plain painting. When the surface is completely dry, one or two coats of varnish are applied. The surface may be glossy or flat, according to the nature of the varnish, or it may be rubbed to any desired finish. When floors are treated in this way the surface may be waxed if desired.

207. Another method of graining is known as brush graining. The priming coat and the body coats are mixed to dry flat, by using not more than $\frac{1}{4}$ oil to $\frac{3}{4}$ turpentine. These coats are colored somewhat lighter than the finished work is to be. When a suitable ground is obtained, the surface is painted with distemper or water colors ground in water, using vinegar for a thinner. While still wet part of the surface is patted with the flat side of a stiff brush, such as a worn calcimine brush. A dry duster brush is then drawn lightly along the wet

paint, lengthwise of the work. This will give somewhat the effect of a fine-grained wood. The various tools may be used to touch up spots as desired. When the surface is dry, at least one coat of varnish is applied, and two are better. When this treatment is used on a floor, it may be waxed after the varnish is dry.

MARBLING

208. Marbling is similar to graining, except that the veinings, colors, and figures of marble or stone are imitated. Samples of various marbles are used as patterns. The ground is prepared practically the same as in graining, except that the ground is somewhat lighter than the lightest color in the finished work. The last coat is laid on in irregular patches, which are then blended into a close resemblance of the marble to be imitated.

PAINTING OLD WOODWORK

209. Number of Coats.—The number of coats to be applied to old woodwork on which the paint is worn, depends largely on the condition of the painted surface. Sometimes a single coat of paint or varnish will restore the original finish. At other times it will be necessary to remove all the old paint. Such jobs will then require as much labor as new work, with the additional work required in removing the old paint.

210. Preparation of Surfaces.—If in good condition, the old paint may first be cleaned with a cloth and a few drops of benzine. This will remove any grease. Caution must be used in handling benzine, as the gas from it will explode if brought in contact with a flame.

The woodwork is next puttied up the same as for new work. When dry, the surface is sandpapered so that the gloss is all removed from the paint. The surface is then wiped clean.

Old wood trim that has been enameled or varnished should be rubbed down with sandpaper, and cleaned with a damp cloth. Nail holes and cracks are then puttied up as for new work.

A waxed surface must be cleaned with alcohol, or by a hot solution of washing powder. Any trace of wax will cause the finishing coat to peel or crack.

When the work cannot be brought to a suitable surface by the means just described, the old finish may be removed with paint or varnish removers and scraping, or by burning, as will be described later.

211. Application.—The priming coat may usually be omitted, as the paint in the pores of the wood cannot be easily removed by any of the processes mentioned and the priming cannot, therefore, penetrate the surface of the wood. The body and finishing coats are applied, however, in exactly the same manner as for new work. In applying enamel, the second, third, fourth, and fifth coats, as described under enamel finish, are applied as described for new work. For economy, the third coat as described may be omitted when the old surface is in a suitable condition.

PAINTING BLACKBOARDS

212. Surface Required.—Blackboards for school rooms require a surface that will take chalk well, that will allow erasure, and that will retain their black surfaces through continued use. The surface must be smooth but not glossy.

The base of the blackboard may be wood for movable boards, or it may be plaster for wall boards. Preferably the plaster should be hard or gypsum plaster. Keene's cement is excellent, as it is hard and durable. It is, however, somewhat more expensive.

213. Preparation of the Surface.—The wood surface will require only a clean smooth surface. The wood should be dressed and then sandpapered to a perfectly smooth and level surface. Well seasoned, wide boards are best; veneers could be used the full width of the board.

Plaster must be smooth and level, and free from soft spots. The surface should be sized, preferably with one or two coats of shellac varnish, to which 2 ounces of lampblack has been

added to each quart of shellac. This surface, when dry, should be sandpapered lightly before the finishing coats are applied.

214. Finishing Coats.—The finishing coats, of which at least three are needed for good work, may consist of a varnish made of 4 ounces of lampblack moistened with alcohol and rubbed to a stiff paste, free from lumps. To this is added, while the mixture is stirred well, 1 quart of orange shellac varnish and 3 ounces each of flour of pumice and pulverized rotten stone, sifted through a fine strainer. If the mixture is too thick to flow easily, more alcohol should be added.

The varnish is to be applied quickly over the prepared surface, with a flat brush and laps are avoided. The varnish will dry quickly, and the second and third coats may be applied at 4-hour intervals. After a day or two, the surface should be gone over with hair or felt dipped in a little fine pumice stone and water, and rubbed to a smooth dull finish.

If desired, ready-mixed preparations may be used, the directions of the manufacturers being followed where they conflict with the process here described.

215. Painting Old Blackboards.—To refinish old blackboards, the surface should be made smooth. Enough of the old finish will probably remain to leave the surface in the condition called for in the preparation for new work. The three coats of varnish may then be applied. Where the surface is damaged it must be repaired, and the treatment will then be the same as for new work.

PAINTING INTERIOR PLASTER WORK

PREPARING AND PAINTING PLASTERED SURFACES

216. Plaster Surfaces.—Interior plaster surfaces to which paint is applied are the surfaces of walls and ceilings. These are formed of lime plaster, gypsum or hard wall plasters, Keene's cement, or Portland cement. The surfaces are generally very smooth, although they are occasionally finished with a sand finish.

217. Materials Used in Painting Plaster.—Oil paints, cement coatings, water paints, flat wall paints, and calcimine are among the materials that are used in finishing interior plaster. They are used for decorative effect mostly, although large quantities of light-colored paints are used in factories in order to make them more cheerful, and to distribute the light.

218. Water paints are made in great variety under various trade names. The base of many of these is whiting, and the vehicle is water. A binder such as glue, gelatine, or casein is necessary to hold the particles of the pigment together, and to cause the paint to adhere to the wall. Water paints can be colored in any desired tint. Manufactured paints are largely used, and the directions printed on the packages should be carefully observed. Some water paints are known as distemper, fresco, calcimine, etc.

219. Flat wall paints are extensively used on interior plaster surfaces. They are composed of lithopone, zinc oxide, coloring pigment, and prepared oils which are mostly tung oil and turpentine. The pigment should consist of about 80 per cent. of lithopone, 10 per cent. of zinc oxide, and 10 per cent. of coloring materials. Flat wall paints should have good covering power and should be washable with soap and warm water.

220. Mill whites are similar in composition to flat wall paints and may have a full-gloss, semigloss, or a flat finish. They are waterproof and possess bright, light-distributing properties.

221. Oil paints can also be used in covering plaster surfaces with excellent results. They are, however, more expensive than the previously mentioned paints, and are consequently less used.

222. Preparation of Surfaces.—If lime plaster has been used, even in the finishing coat of plaster, it is advisable not to paint the plaster for several months, so that the lime will have time to slake thoroughly. If for some reason, however, the wall must be painted when the rest of the house is finished, it

may be washed with a preparation consisting of sulphate of zinc in water, about 2 pounds of sulphate being used to 1 gallon of water. If the surface of a lime-plastered wall is soft and chalky, the wall should be thoroughly soaked with clean water, after which it will probably harden and can be painted when dry.

If hard wall plaster has been used the foregoing treatment is unnecessary.

223. Filling Cracks.—In all cases all cracks or breaks in the plaster surfaces must be repaired. Cracks should be cut out so as to remove all crumbling edges. The cut should be wider on the inside of the plaster than at the surface, so that when new plaster is placed in the cracks it will obtain a good hold. The filled cracks should be smoothed over so that when painting has been done they will not be visible.

224. Oil spots or discolored spots should be coated with a thick coat of paint thinned with turpentine so as to dry flat. Spots touched with shellac are apt to show a gloss after the painting is finished. After the cracks are filled and the spots covered the whole surface should be sandpapered so that it will be thoroughly smooth.

225. Sizing.—New plaster walls are more or less absorbent, and the surface must be treated to stop the suction and to hold the paint. Sizing is the operation of closing the pores of the plaster by means of a size, thus forming a base for the paint. The process is similar to priming on wood surfaces. One of the best sizes is one or two coats of white lead and oil paint. Glue size, which is a weak solution of glue, may be applied over a first coat of oil paint. In some cases the glue size is put on a new wall, but this is suitable only when the wall is to be papered.

Another size, known as varnish size, may be made from varnish thinned with turpentine, and to which has been added enough of the paint mixed for the finishing coat to give a little color to the mixture.

226. Painting the Plaster.—If oil paints are to be used they are applied in the same manner as has been described for

other work. The paint should be applied uniformly and brushed out to form a smooth surface. If water paint or calcimine is to be applied, 4-inch flat wall brushes are used for all coats. The paint should be applied quickly and brushed as little as possible. It is applied in sweeping, curved strokes. The paint should be mixed thin, and put on so that it will level up or smooth out by itself. After the first coat has been applied, a coat of sizing may be applied. The subsequent coats, usually two, are applied in a manner similar to the first coat. Flat wall paints dry quickly and should be put on quickly and let alone.

It is desirable to have good ventilation while painting is being done. The windows should, therefore, be open if possible. The atmosphere should also be warm, which will assist the paint in drying.

227. Stippled Finish.—A stippled finish is secured by gently pounding the wet surface with the ends of a stiff brush. The object of stippling is to remove all brush marks, and to produce a uniform surface having the appearance of little pores all over it. The paint for stippling is mixed a little thicker than for plain work. Sometimes a little plaster of Paris is added to the paint. This gives a rougher surface, which will produce a stronger stippled surface.

228. Repainting.—In repainting plaster it is seldom necessary to remove the old paint. Damaged places should be patched and shellacked or primed. When all the surfaces are in good condition, the procedure is the same as in new work after the priming coat has been applied. Sometimes, when the work is in good condition, and the color is not to be changed, only the finishing coat need be applied. In general, however, the body coats and the finishing coat are put on.

CALCIMINING

229. Materials.—The base of calcimine is whiting, and as stated, the calcimine may be prepared by the painter or purchased ready for mixing with hot or cold water. Calcimine is made in white and colors, so that any tint may be secured.

230. Mixing.—The colors appear much darker when wet than when dry. The proper mixture can be determined only by allowing samples to dry. Only enough calcimine is mixed to finish one room at a time, as it is not advisable to keep it over night.

231. Preparation of Surfaces.—The best preparation for a calcimine job is a coat of oil paint mixed to dry flat, and colored as near the finished color of the calcimine as possible; or a varnish size may be put on the walls, the size colored with a little paint or color to match the finished work. For best results the surface should be rough, and a little plaster of Paris added to the paint will give a rough surface, or tooth, to which the calcimine will adhere.

232. Application of Calcimine.—The calcimine should be brushed on evenly, using a wide calcimine brush. (See Fig. 7.) Small areas are blocked out, first with vertical strokes and then with cross strokes, the edges being kept wet so that the laps will not show. Narrow strips are applied, so that the next strips may be put on before the edges dry. When a room is finished the doors and windows should be opened, so that the work will dry quickly and evenly.

233. Repainting Calcimine.—Usually it is necessary to wash off the old calcimine before applying a new coat. Warm water with soda or washing powder and a sponge will be required for this work. This will not remove a priming of paint or varnish size. In some cases it will be advisable to use a glue size if the surface is not in good condition after the old calcimine has been all removed. The application of the new calcimine is the same as for new work.

WHITEWASHING

234. Definitions.—*Whitewash* is a mixture of slaked lime, salt, and water, with certain other materials in the form of a paint that may be applied to exterior and interior surfaces. The process of applying the whitewash is known as *whitewashing.*

235. Properties of Whitewash.—Whitewash is used on account of its light color to improve the appearance of buildings, etc., and to freshen up dark places and corners. It has a preservative effect on wood and masonry. The lime prevents decay and the growth of fungus. Metal work coated with whitewash is prevented from rusting, and for this reason it is valuable for covering farm machinery, tools, etc. When applied to trees and shrubs whitewash protects against insect pests.

236. Preparation of Surfaces.—The surfaces to be whitewashed should be cleaned of all dirt, scales, or other loose material by brushing or scraping. Before the whitewash is applied, the surface should be dampened so that the fresh material will dry gradually. The best results are obtained when the work is done in clear, dry weather.

237. Methods of Mixing.—Whitewash may be prepared in a number of ways, from a plain solution of slaked lime and water, to preparations that have many of the properties of calcimine or good paint. A formula for whitewash, suitable for general work, recommended by the National Lime Association, is as follows:

Dissolve 15 pounds of common salt in 7½ gallons of water. To this solution add 50 pounds (1 bag) of hydrated lime or the putty made by carefully slaking 38 pounds (½ bushel) of fresh quicklime. Mix thoroughly until a thick paste is formed. Thin to desired consistency with fresh water. The quicklime paste should be strained through a fine screen, while still thick, before using.

On work where chloride of calcium is available, 5 pounds of dry calcium chloride may be substituted for the salt in the foregoing formula. This mixture does not chalk and is quite desirable.

A formula recommended by the Maryland State Highway Department is as follows:

Dissolve 12 pounds of salt and 6 ounces of powdered alum in about 4 gallons of hot water. Add 1 quart of molasses. Make a thick cream by thoroughly mixing 50 pounds (1 sack) of hydrated lime with about 7 gallons of hot water. Add the first solution to the lime, stirring vigorously. Thin to desired consistency.

In the foregoing formula, 38 pounds (½ bushel) of fresh quicklime may be substituted for the hydrated lime. The quicklime must be slaked carefully and screened before use.

Where the whitewash must not rub off, casein and glue are added. Skim milk is sometimes used in place of water. Carbolic acid and formaldehyde are used to give disinfectant properties. Borax and trisodium phosphate are used to make the whitewash more fire-resisting.

Whitewash will be improved by allowing the slaked lime to stand for a time before it is used, and stirring it occasionally. Lime solutions must always be cooled before they are mixed with other ingredients.

238. Coloring Whitewash.—Whitewash may be tinted any desired color by adding pigments that are not affected by lime. The earth colors, such as Vandyke brown, red oxide, yellow ocher, siennas and umbers, Venetian red, Indian red, and light red are satisfactory. The pigments known as cadmium yellow, ultramarine, cobalt blue, chrome green, emerald green, lampblack, and other black pigments may also be used. The colors may be purchased as dry powders and added to the whitewash in such quantities as are necessary to give the desired color. It is advisable to prepare a small sample and allow it to dry before any considerable quantity is mixed, so as to be sure that the desired color will be secured.

239. Application of Whitewash.—Whitewash may be applied by a brush or by a spraying device. The best results are secured by a thin coat. The whitewash should be applied evenly, and should not be brushed out as with oil paints. For reaching high walls, ceilings, and difficult places, the extension spray hose is used, or the brush may be attached to a pole or long handle.

240. Quantities Required.—One gallon of whitewash will weigh about 12 pounds, and will cover on rough wood about 200 to 225 square feet, one coat. On brick it will cover about 180 square feet, one coat. On plaster it will cover about 270 square feet.

One man with a 4-inch brush will cover on rough walls about 200 square feet an hour, on smooth walls about 340 square feet, on flat surfaces about 360 square feet, and on ceilings, a step ladder being used, about 225 square feet.

PAINTING MISCELLANEOUS SURFACES

241. Priming Wall Board.—The priming coat on wall board may be a varnish size containing a small amount of the paint to be used for the finishing coat. Regular oil paint thinned with one-half boiled linseed oil may also be used. The surface should dry thoroughly before the body and finishing coats are applied.

242. Painting Applied Materials.—Various materials, such as burlap, paper, canvas, and Sanitas, may be applied or pasted on the walls. The surfaces of these materials are prepared for painting by a priming coat similar to wall board, and the finishing coats are then applied. With suitable combinations of colors, the surface may be made highly decorative.

243. Keene's Cement Surfaces.—Bathrooms, kitchens, pantries, laundries, and halls, which require frequent cleaning, are often plastered with Keene's cement, and finished with enamel. Enamel finish may be applied over the priming coat in the same manner as described for wood surfaces.

WOOD FINISHING

INTRODUCTION

244. Definition.—The processes and materials employed in painting woodwork have been described. Painting covers the surface of the wood and forms a new surface of paint which does not depend for its effect upon the grain and color of the wood. Wood finishing, as defined in Art. **2,** consists of treating the wood surfaces so as to develop the beauties of grain and color in the wood, and of covering the surface with a transparent coating that will protect the surface and add to the beauty of the grain and color.

Wood finishing is usually applied to the interior woodwork of a building, such as the door and window trim, doors, wainscoting, stairs, cornice, etc.

Almost any kind of wood is capable of being finished as just described. Some woods, however, have colors and markings that make them particularly desirable for artistic effects. The colors can be greatly modified by staining the woods with stains of different colors. The grain can also be emphasized by the use of stains and fillers. The finish just described is sometimes referred to as natural finish.

245. Kinds of Woods Used.—The kinds of wood preferred for a natural finish are hardwoods, such as oak, birch, walnut, mahogany, gum, maple, and sycamore. These woods are generally used as veneers over less expensive woods. The thin veneer shows the grain and color exactly as well as a solid piece. Many soft woods, such as yellow pine, Douglas fir, cypress, etc., also possess grain and color that can be treated artistically with a natural finish. A knowledge of the characteristics of these different woods and of how to develop their best possibilities is of the greatest value to painters and wood finishers. This knowledge can best be obtained through observation and study of the woods, both unfinished and finished.

246. Processes Involved in Finishing Woods.—The principal processes employed in finishing woods are *staining, filling, varnishing,* and *waxing,* which will next be described.

STAINING

247. Definition and Purpose.—Staining is the application of a liquid preparation, called a stain, to the surface of the wood for the purpose of developing or changing the color, and to bring out the figure or grain of the wood. As the stain affects the wood irregularly, acting strongly or feebly on different parts of the wood surface, the grain is emphasized accordingly. Stains are often used to produce an imitation of a rarer or more expensive wood in a less costly wood, as by staining birch to represent mahogany. Stains are often used to give richer

or darker tones to wood than they naturally possess, as in the case of oak and mahogany.

248. Kinds of Stains.—There are several kinds of stains, each of which is applicable to certain kinds of woods, and to obtaining certain effects of color. The principal ones are *oil stains, aniline oil stains, water stains, spirit stains, acid stains,* and *varnish stains.* These may be purchased in prepared form or may be mixed by a skilful painter.

249. Oil Stains.—Oil stains are made of pigments such as are used in making paints, but only those which are transparent should be used for stain. The pigments are mixed with linseed oil, generally boiled oil, and then thinned with turpentine or benzine. More turpentine or benzine is used than oil, as the stains should penetrate the wood rather than form a film on the surface.

250. Woods are open-grained and close-grained. The open-grained woods absorb the stain more freely than the close-grained. It is often necessary in staining close-grained woods to add 1 pint of benzole in place of 1 pint of linseed oil to the stain, so that it will penetrate these woods more easily. The pigments best adapted for stains are Prussian blue, French yellow ocher, burnt sienna, the umbers, Vandyke brown, etc.

251. Aniline Oil Stains.—Aniline oil stains are made from coal tar. There are hundreds of these aniline dyes. By mixing them, almost any desired stain color can be obtained. These stains are, however, not as durable as those made with mineral pigments, but they are brighter and more transparent. The powdered aniline stains are mixed with boiled linseed oil, turpentine or benzine, and drier. If it is desired to thin these stains turpentine or benzine is added.

252. Aniline Water Stains.—Some aniline stains are soluble in water. Stains can be made by simply mixing in boiling water. The depth of the color of the stain is regulated by the amount of water used.

253. Water Stains.—Water stains are made with water and soluble pigments or aniline dyes. Water stains afford the

cheapest form of stains, and are often the most satisfactory. The application of water to the surface of the wood is likely to raise the grain and make the wood rough. It must then be sandpapered, which process involves time and labor, and also the risk of rubbing the stain off in spots.

254. Spirit Stains.—Spirit stains are used sometimes in place of water stains, as they do not raise or roughen the grain of the wood. They are made by dissolving aniline colors in denatured alcohol. They must be handled with considerable skill to obtain uniform results.

255. Acid Stains.—Acid stains depend upon chemical effects to produce the desired colors in wood. Among the chemicals used are ammonia, potassium bichromate, copper sulphate, potassium bichloride, and muriatic acid.

256. Varnish Stains.—Varnish stains are stains in which the vehicle is varnish. Any of the pigments or colors used with oil stains may be used with varnish stains. Varnish stains are often used on floors, as the stain not only colors the wood, but fills the pores and dries with a gloss. Varnish stains are used by people who are not painters for refinishing furniture, and for odd jobs around the home.

257. Application of Stains.—The process of staining consists principally in laying on the stains in the form of washes, so as to produce a desired color on the surface of the wood, and also to enhance the grain. Stains may be applied with a brush, a sponge, or a cloth. As a rule, stains are applied rather liberally and the surplus is wiped off with rags, the aim being to avoid brush marks.

FUMING

258. Definition.—*Fuming* is a process of staining or coloring wood by subjecting it to the fumes of ammonia. The process is applicable to woods containing substances affected by the fumes. Thus, oak and chestnut contain tannin, which turns dark when exposed to ammonia.

259. Process.—Fuming is done by placing the woodwork in racks in a tight box or room, and placing on the floor small dishes containing strong ammonia. The box, called a fuming box, is closed tightly, and the process is completed in from 12 to 36 hours, according to the color of the wood desired. The progress of the fuming may be judged by removing small samples of the wood from time to time.

260. Advantages of Fuming.—Fuming does not raise the grain of the wood, gives a uniform and permanent coloring to the wood, and forms a surface to which wax may be applied. The wood must be clean and dry before fuming. Any places covered by glue, shavings, etc., will prevent the fumes from reaching the wood, and imperfect results will be obtained.

261. Imitation Fuming.—Fuming may be imitated by applying the ammonia directly to the wood. This, however, raises the grain of the wood, and the color is not so satisfactory. Other chemicals are also used. Stains may be mixed to approximately the color obtained by fuming, but in general the effect is not so good as the genuine fuming.

FILLING

262. Definitions.—Fillers are materials that are applied to the surfaces of woods for the purpose of filling the pores of the wood, and for forming firm, hard, level surfaces to which the varnish may be applied. The fillers also prevent the absorption of the varnish by the wood, and thus saves that material.

The essential parts of a good filler are a transparent non-absorbing base or pigment, and a vehicle that also serves as a binder. The best pigment is silex, which is simply powdered quartz. China clay, whiting, cornstarch, ground glass, barytes, talcum, and marble dust are sometimes used. The vehicles used are linseed oil, quick-drying varnish, and Japan. Fillers are often colored with the stains already mentioned, so as to save the labor of applying the stain and filler separately. Fill-

ers are known as paste fillers and liquid fillers, and may be purchased ready for use.

263. Paste Fillers.—Paste fillers are used on open-grained woods, such as oak, ash, chestnut, walnut, and mahogany. The filler is brought to a stiff brushing consistency by thinning with turpentine, and the color is tested by applying it to waste pieces of the wood that is to be finished.

Other hardwoods, which do not absorb so readily, such as birch, cherry, and maple, are sometimes filled with paste filler.

264. Application of Paste Fillers.—The filler is applied to the bare surface of the wood with a fairly stiff brush, and a thick coating is applied. The filler is brushed first across the grain, and then smoothed off lightly parallel with the grain. When the filler begins to harden slightly, or to assume a lusterless appearance, it is wiped off. It must be watched closely and not permitted to dry beyond the point at which it may be wiped off easily. It is then wiped briskly with a rag or waste, across the grain at first, so as to work the filler well into the pores of the wood. After the first rubbing the surface should be wiped thoroughly with a clean rag, removing all surplus filler from the surface of the wood. Any parts not wiped clean will have a cloudy appearance. If this cloudy film or haze is allowed to dry, it will be difficult to remove. The filler that has been worked into the corners of the panels and crevices of the moldings must be scraped out with a sharp-pointed hardwood stick. The work should then be allowed to dry for at least 12 hours before being varnished. For extra-fine work a second coat of filler is sometimes applied in the same manner as the first coat, the filler being thinner than that used in the first coat. This will insure a level surface on the most porous or open-grained woods.

265. Liquid Fillers.—Liquid fillers are applied to close-grained woods, or to those having small pores, such as the pines, spruces, cedars, etc., birch, as well as beech and maple. Some painters prefer to apply paste fillers to these woods also, and birch is capable of taking either paste or liquid filler.

Liquid fillers have the same general composition as paste fillers, but are thinned down with turpentine or other thinner. Shellac is sometimes used as a liquid filler. Liquid fillers are allowed to dry thoroughly, and are then sandpapered down to the wood, but not so far as to remove the filler that has penetrated the grain of the wood. The cheaper grades of varnish, solutions of rosin, etc., are also used as liquid fillers. Unless the sandpapering is done, the surface of the wood will be clouded, and the grain of the wood will be hidden.

266. Puttying.—After the staining and filling have been completed, all nail holes and cracks should be filled with putty, which should be colored to match the stain. The work will then be ready for varnishing or waxing.

VARNISHING

VARNISH

267. Definitions.—*Varnish* is a solution of certain gums or resins in linseed oil, turpentine, alcohol, or other liquids, that produces a hard, transparent coat on the surface to which it is applied.

Some of the gums used in making varnish are copal, damar, mastic, Kauri, rosin, and shellac. When these gums are dissolved in linseed or other oil, or in turpentine, they form *oil varnishes*. When dissolved in alcohol they form *spirit varnishes*.

268. Qualities of Good Varnish.—The desirable qualities of a good varnish are quickness in drying, hardness and toughness of the film or coating, the amount and permanence of the gloss, and durability. When used for exterior work it should stand exposure to the weather. For inside use the better grades should produce a good gloss, or luster, and be capable of being rubbed and polished. Varnishes for floors should be hard and tough, and should not show scratches when walked upon.

Varnish should work easily under the brush, flow or level itself perfectly, possess a good luster or gloss, set in a reasonable time, and eventually become hard enough to resist a certain amount of rubbing. It should not have much color, and should stand exposure to the weather and ordinary wear and tear. Time is required to test a varnish perfectly. A winter's exposure to the weather will show up any faults in the varnish, but few jobs can wait that long for a test. The name of the manufacturer, and the use of a varnish recommended for the particular position, is usually sufficient in choosing the varnish.

The poorer grades of varnish are made with cheaper gums and substitutes for oils and turpentine. It is obviously unsafe to use such goods. The best way to judge of the quality of a varnish is by the reputation of the manufacturer. A reputable manufacturer will supply a good varnish. Varnishes should be delivered at the building in the original containers, and the containers should not be opened until they have been inspected by the architect or owner.

KINDS OF VARNISH

269. General Classification.—Generally speaking, varnishes are divided into *oil varnishes* and *spirit varnishes*. Oil varnishes are known as *short-oil* and *long-oil* varnishes. A short-oil varnish has a minimum amount of oil, such as 5 to 10 gallons to 100 pounds of gum. A long-oil varnish may be made with 20 to 40 gallons of oil to 100 pounds of gum. Long-oil varnishes are more durable than short-oil varnishes, and the film is tougher. Short-oil varnishes may, however, have greater luster. Long-oil varnishes are used as rubbing, polishing, interior, and exterior varnishes. The oil gives life to the varnish when used within proper limits.

270. Spar Varnish.—Spar varnish is a long-oil varnish especially adapted to exterior use, as it responds to expansion and contraction. It is also used for interior work.

271. Coach Varnish.—This term is applied to a long-oil varnish that is used for interior architectural work, and dries with a high gloss.

272. Damar Varnish.—Damar varnish is made from damar gum. The characteristic of this varnish is its whiteness. It is used as a vehicle in making enamel paints.

273. Shellac.—The best-known spirit varnish is shellac, made by dissolving gum lac in alcohol. Two kinds of shellac are made, orange and white. Orange shellac is the natural gum in alcohol. White shellac is bleached orange shellac. Shellac dries quickly owing to the rapid evaporation of the alcohol.

274. Finishing Varnishes.—High-grade finishing varnishes are long-oil varnishes, which have good wearing qualities. They are made for exterior and interior work. They are of a slow-drying nature, which makes them elastic and durable. Exterior finishing varnishes are somewhat more durable than interior finishing varnishes, as they must withstand the effects of the weather.

275. Rubbing Varnish.—Rubbing varnishes are any good varnishes that can be rubbed successfully. They should be quick-setting, hard-drying varnishes. Most varnishes can be used, if necessary, as rubbing varnishes. The idea of rubbing the surface of a varnish is to smooth it and to remove any irregularities, thus forming a good basis for the next coat of varnish. The rubbing varnish is used for undercoatings.

276. Floor Varnish.—Floor varnishes are subject to hard service and should be made accordingly. They should be tough. Excellent floor varnishes are made and sold today, and should be applied according to the manufacturer's directions. Varnishes made for other uses will not give the same service that a floor varnish will give

277. Flat Varnishes.—Flat, or flatting, varnishes, will dry with little or no luster, and produce the same effect as a glossy varnish that has been rubbed with pumice stone and oil or water.

APPLICATION OF VARNISH

278. Preparation of Surfaces.—For natural finish the wood surfaces should be stained and filled, and all nail holes, cracks, and other imperfections properly puttied. The work should be sandpapered when necessary, and thoroughly dusted. It is then ready for varnishing.

279. Conditions Favorable for Varnishing.—The temperature of the air should be about 70° F. before varnishing is attempted. The air should be dry and rooms in which the work is being done should be kept free from dust and drafts of cold air. All the utensils used in varnishing should be clean, the brushes included.

280. Number of Coats.—Two coats of varnish are usually applied to wood surfaces, in addition to the preparatory work of staining and filling. For very fine work, a third coat is sometimes given to some open-grained woods, such as oak.

281. Covering Capacity of Varnishes.—The surface a gallon of varnish will cover depends on the thickness of the applied coat and on the nature of the varnish. Thick-bodied varnishes will not cover as much surface as the thinner-bodied varnishes. For ordinary work, a gallon of oil varnish will cover from 500 to 600 square feet of surface, one coat, or 250 to 300 square feet, two coats.

Spirit varnish or shellac will cover about the same area as oil varnish.

282. Thinning Varnish.—Varnish is usually applied as it comes from the manufacturer. If the varnish has thickened, owing to exposure to the air, it may be thinned with turpentine to its original consistency. After being thinned, the varnish should stand for at least one day before it is used. The quality is said to be improved by keeping the varnish warm, but not hot.

283. Applying Shellac.—Shellac is applied with a flat bristle brush, such as shown in Fig. 10. For the lighter-colored woods white shellac is used, but for the darker woods

orange shellac is preferable. The shellac is spread on evenly and as rapidly as can be done, so as to leave no brush marks. The material dries very quickly, and the work must be covered with one application. After the shellac has dried for a few hours it is hard enough to be sandpapered. This is done with 0 or 00 sandpaper. Shellac is not generally applied to outside woodwork.

284. Applying Oil Varnishes.—Oil varnish is applied liberally over as large an area as can be handled safely. In paneled work the panels are varnished first, and then the stiles and rails. The varnish is applied usually with a flat bristle varnish brush, about $2\frac{1}{2}$ to 3 inches wide. Smaller brushes are used for small work or for varnishing in corners where the varnish is apt to sag or run. The varnish is worked across the surface with no attempt to stretch it out and the work must be carried on so as not to leave brush marks, lap streaks or joints in the surface. The edges should be kept fresh until the work is finished. The varnish is laid off in the direction of the grain with the tip of the brush, the varnish being kept thin at the angles and corners.

The first coat of varnish should dry well before it is rubbed. The kind of varnish used will determine the time, but at least 48 hours is necessary with ordinary varnish. A quick-drying varnish is used when the coat is to be rubbed.

Before the second coat is applied, the surface should be gone over lightly with No. 00 sandpaper to remove all projecting nibs or specks of dirt or grit. After dusting, the second coat may be put on. The application of the second coat is similar to that of the first, except that a thicker coat of varnish is left on the work, the varnish being flowed on instead of brushed out. Flowing consists of putting on all the varnish that will stay in place without running or sagging.

285. Rubbing With Water.—After the varnish has 3 days or more in which to harden, it may be rubbed. The object of rubbing is to remove the natural gloss of the varnish, and to form a smooth surface. Rubbing is done with a piece of felt or heavy cloth fastened to a block of wood. It is dipped in

water and fine pumice stone, and is then rubbed over the surfaces. Moldings and corners may be rubbed with a stiff brush dipped in the same materials. Rub the surface lightly to remove the gloss. More rubbing is apt to cut through the varnish, especially at the corners or edges, thus requiring additional coats of varnish and more rubbing. When the rubbing has gone far enough, the surface is washed off with cold water and wiped dry. The pumice stone must be dug out of corners and angles with a pointed hardwood stick.

286. Rubbing With Oil.—The process of rubbing with oil is the same as that of rubbing with water, except that a mixture of equal parts of raw linseed oil and benzine is used instead of water, and the washing off with water is omitted. The cutting properties of pumice and oil are somewhat slower than with water, and the dull surface is not obtained so easily. This is the finish usually employed on interiors, however. The surface is wiped clean and dry with waste or cheesecloth when the surface has been sufficiently rubbed.

287. Polishing.—When an extra-fine finish is desired, the water rubbed surface may be polished. This is done with pulverized rotten stone instead of pumice stone. The polishing consists simply of rubbing out the fine scratches left by the pumice, and producing a perfectly smooth surface.

288. Varnishing Floors.—A new floor must be properly scraped and sandpapered before the application of the filler to fill the pores of the wood. If there are any cracks, these should be carefully filled with crack and crevice filler after sandpapering. Most hardwood floors are so tightly joined, however, that there are no cracks.

After the floor has been scraped and sandpapered, the wood should be filled with paste filler, which makes a foundation for the finish. This should be done regardless of whether the wood is hard or soft, because the proper results cannot be obtained by applying varnish or wax directly to the bare white wood. Liquid fillers should never be used on any floor.

After filling a new floor, finish with two coats of floor varnish.

VARNISH TROUBLES

289. Defects in Finished Work.—Varnish is a very sensitive material, and is affected by changes in temperature, dampness, and cold. It should be applied to a clean, roughened surface in order to adhere well. A lack of light and ventilation will cause the varnish to dry slowly. Poor materials in the under coats, or in the varnish itself, will result in unsatisfactory finishes. Thinning with impure turpentine, mineral oils, etc., will produce poor surfaces. When the finish is a failure it should be taken off, down to the bare wood, and the surface should be refinished, proper materials and workmanship being used.

Blistering is caused by moisture or oil under the varnish, or by heat acting on sap or damp wood. Exposure to the sun before the varnish is dry will raise blisters on the surface. The wood and every coat should be dry before the next coat is applied over it.

Blooming is the formation of a bluish-white film on the surface. It is caused by dampness or frost, excessive driers in the varnish, or gas fumes, such as ammonia or coal gas.

Cracking or *checking* is due to expansion and contraction, and may often be explained by the difference in elasticity of the several coats applied. The coats should be dry, and a quick-drying varnish should not be applied over a slow-drying one. It may also be caused by washing with hot water, or by fumes of gases.

Bubbling is caused by having the varnish too warm. The varnish should not be much warmer than the room where the work is finished.

Brush marks may be caused by using too small a brush, or by brushing the varnish out too much.

Roping is the refusal of the varnish to spread evenly to a level surface. The usual cause is low temperature of the varnish or wood, and too strong a draft. Ventilation is important, but drafts are to be avoided.

Specking causes the work to appear as though covered with fine grit, and is caused by freezing or chilling of the varnish.

This causes some of the gums to harden. A suggested remedy is to heat the varnish to about 200° F., which will melt the gums and permit them to mix again with the vehicle.

WAX FINISHING

290. Definition.—*Wax finishing* is the process of applying a finish consisting of dissolved wax to a wood surface that has been previously stained, filled, and shellacked. It is sometimes used instead of a varnish finish. Wax finish is used more frequently on floors, and is often applied over one or two coats of hard-drying floor varnish.

291. Materials Used.—There are various waxes and combinations of waxes used in wax finishing, all of which have their merits. A very common wax is beeswax that has been dissolved in turpentine. Beeswax is, however, rather soft and is improved by the addition of paraffin, which is harder. In some cases paraffin dissolved in turpentine is used.

A good wax is Carnauba wax or ceresine wax in turpentine. A mixture of one-half Carnauba wax and one-half ceresine wax is a good one to use.

Manufacturers make most of the waxes that are used for wood finishing. By using these prepared waxes a uniformity in the wax is assured, and the labor of mixing waxes for each piece of work is saved.

Waxes are often colored to match the color of the stain that has been used on the wood that is to be waxed.

292. Preparation for Applying Wax.—On wood trim the surface is stained and filled. A coat of shellac or varnish is then applied. When this coat is thoroughly dry the wax may be applied. When wax is to be applied to floors it is advisable to stain and fill the surface and apply two coats of floor varnish to withstand the wear that the floor will receive. The varnish coating will preserve the color of the floor.

293. Number of Coats.—One coat of wax is generally sufficient, especially for trim, but two or three coats are better for

a floor. Worn portions of the floor surface can easily be refinished by the use of more wax and additional rubbing.

294. Application of the Wax.—The surface must be clean and dry before the wax is applied. The wax is applied with a rag or a stiff brush, and a very thin coat is rubbed over the wood. In one or two hours the turpentine will have evaporated, leaving the wax with a dull surface. This surface is then rubbed with felt or old carpet until the desired surface is obtained. A second polishing a day or two later will improve the surface. The secret of successful waxing is in applying a very thin coat of wax and rubbing a great deal.

As the cost of the waxing is about 80 per cent. labor, the cost will be fully as high as a good varnish finish.

Water on a waxed floor will ruin the surface. Wet spots should be dried, and when dry the spots should be waxed the same as for a new floor.

Floors are usually polished with a weighted brush. The weight saves the labor of hard rubbing by hand. The weight is covered with carpet or soft cloth according to the finish that is being given.

Waxed floors may be cleaned by wiping with a soft cloth dipped in a mixture of equal parts of turpentine, sweet oil, and vinegar. This application is polished by rubbing with a clean soft cloth, which may be wrapped around a floor brush.

When it is desired to remove the old wax entirely, it can be done with turpentine or benzine.

VARNISH REMOVING

295. Varnish Remover.—If the old surface has deteriorated or cracked badly, the varnish will have to be taken off down to the bare wood and the work done over. In such a case, varnish remover is used. It is a powerful solvent of varnish and contains benzol, wood alcohol, amyl acetate, and a variety of other chemicals. Its action is to loosen up the varnish to a point where it may be removed with scrapers or wiped off with waste and dusted out of corners with a stiff bristle

brush. It is applied liberally with almost any kind of brush and is allowed to remain on the surface until all varnish has been loosened, down to the wood, when it may be scraped and washed off. If one application does not soften all the varnish, a second or a third may be used. The remover is put on with the flat of the brush, and in from 10 to 15 minutes the varnish can usually be scraped off. A thorough washing of the surface with benzine or denatured alcohol will then put it in condition for revarnishing. It is very important that all traces of varnish remover be washed off; otherwise the new coat of varnish will not dry properly.

296. Bleaching Stains.—Stains or discolorations are produced in wood by the action of moisture and the scorching rays of the sun. Such defects are sometimes bleached to restore the original color of the wood. This is accomplished with oxalic acid, the crystals of which are dissolved in water to form a saturated solution; that is, crystals are stirred into the water until it will dissolve no more. This liquid is applied to the surface to be bleached and allowed to soak in until the desired result is obtained, when it is washed off with clean water. Every effort must be made to remove all of the acid by repeated washings with clean water. If no such precautions are taken, the varnish applied afterwards may refuse to dry; or, the acid may work out and cause the spot to reappear after the surface has been varnished again.

297. Final Operations.—If the varnish has been removed entirely from the interior surfaces, the operation of revarnishing is carried on precisely as in the varnishing of new work. If spots have been repaired, these are touched up and varnished. Frequently it will be found necessary to revarnish the entire work, although this depends on the condition of the surface. Sometimes the old varnished surface may simply be rerubbed and so made to give a satisfactory appearance. If varnishing is done, the usual time for drying should be allowed, after which the surface is ready for rubbing. An oil rubbing is generally considered good enough for the ordinary building.

PAINT REMOVING

298. When paint has flaked off clear to the wood, all the paint should be removed, and for this purpose the torch or chemical paint remover are the means employed. The desirability of the torch is lessened somewhat by the danger of fire. It need hardly be said that a torch does not burn the paint off, but merely softens it. It is necessary to hold the torch in one hand, and in the other a scraper with which to scrape off the paint while it is still hot. The flame should soften the paint clear to the wood before scraping is commenced. A broad, blunt blade should be used and a canvas glove should be worn on each hand.

For moldings and delicate flutings, the torch should not be used. There is too much danger of marring the work. Here paint remover is best, and instead of a steel scraper, one made of hard wood should be employed. Many architects insist on this latter point.

299. Commercial paint removers are very volatile and hence impracticable for general outside use where the air would soon evaporate them. They should never be placed near fire, as they are quite inflammable. Liquid removers do not remove the paint but merely soften it so that it can be easily scraped off. They contain some sort of waxy material to keep them from hardening after being applied. Plenty of time should be allowed for the liquid to do its work before scraping off the paint is begun.

After the old paint is removed the surface should always be sandpapered. It can then be repainted in the same manner as new wood.

INTERIOR DECORATION

PRINCIPLES AND METHODS

INTRODUCTION

1. Interior decoration consists of clothing the walls of the rooms in a building with some material, or treating them in some manner to render them pleasing to the eye and harmonious with the purpose of the apartment. The scale and degree of magnificence of the building may materially affect the expense put into decorative work.

Decorations do not necessarily add to the expense, but simply require the application of elements in harmony with good taste and with the finish of the building. Paint is applied to interior woodwork primarily to protect it, but inasmuch as paint must be used, there is no reason why it should not be used with decorative effect, which can be obtained by the proper combination of colors. Walls are usually painted, frescoed, paneled in wood, or covered with some fabric, as paper, burlap, cloth, leather, or other material.

2. The work of the designer of interior decorations consists of three parts: (1) the preparation of the design as a pictorial suggestion; (2) the working up of the details and practical drawings after the pictorial suggestion has been accepted; and (3) the carrying out of the decorative scheme in the materials specified.

The materials adaptable to interior decorative schemes are unlimited. It is not improbable that every fabric that has ever been made has at one time or another been used as a wall covering. Many of these are unsuited to the purpose, but in the majority of cases the application has been a

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success. The more common forms of treatment consist of wood paneling, tiling, marble work, and metal for inflexible materials, and paper, cloth, leather, etc. for a flexible finish. Marble and leather being particularly expensive for this purpose, an imitation of these is manufactured in paper (specimens of which will be referred to later on), but these imitations are limited in their application.

3. It should be borne in mind that no matter what material is used for decorative effect, it should show itself to be what it is, and not pretend to be anything else. If the character of a room does not warrant the expense of marble wainscots or mahogany paneling, then the decorative effect should be carried out in some simpler material, but not in imitation of what cannot be afforded.

In designs for scenery and stage settings, it is perfectly proper and in keeping that the whole substance be an imitation, as the temporary character of the structure demands economy of materials, while the play itself, being an imitation of real life, requires the appearance of realism.

Designs for interior decoration should therefore be considered in the actual material at all times, while the substitution of imitations should be resorted to only when, as just stated, the temporary character of the structure makes the imitations preferable to the real thing.

4. Interior decoration is not necessarily a branch of art separate and distinct from architecture. Beams are required to support floors, girders are introduced to carry the beams, and columns are necessary to uphold the girders. Therefore, these elements themselves may be made decorative in order to produce the desired effect. The introduction of the classic column or the pilaster at once suggests the idea of a pedestal or a dado to form a wainscot and an architrave to clothe the beam. The pilasters may be multiplied to form vertical elements for the subdivision of the wall space, and at once the wall surfaces become divided into a series of panels that in themselves present framed surfaces to receive individual decorative attention.

TREATMENT OF WALL SURFACES

SUBDIVISION

5. When the walls of an apartment are to be subdivided into panels or into bands the first consideration is that of *proportion*. There are no set rules governing such proportion, as it will vary with the circumstances of each case. Again, several treatments will find favor with different persons, and as *unity* and *variety* are the chief elements of beauty, the most satisfactory results will be attained only when a design presents the most pleasing variety with an expression of unity, and this will vary under different conditions.

6. Classic architectural treatment demands the subdivision of a building into three parts; namely, the basement, the superstructure, and the roof; and in the classic orders, this idea is carried out in the subdivision into the pedestal, the column, and the entablature. Again, the pedestal is subdivided into the base, the dado, and the cornice; the column into the base, the shaft, and the capital; and the entablature into the architrave, the frieze, and the cornice. Yet the proportions of these subdivisions are different in each case, as the purpose of each combination is different. Variety is attained by the variation of the several proportions, while unity is maintained by the systematic relations of the whole.

7. The walls of a room may be similarly divided into three parts—the *dado*, the *frieze*, and the *field*—but the proportion of one to another must depend entirely on the proportions of the walls themselves. With square walls, a satisfactory proportion is to make the dado one-third, and the frieze one-fifth, of the entire height, as shown in Fig. 1 (*a*); whereas, in a long, low wall the proportion of the frieze and dado should be less, as shown in (*b*). Where the dado is about one-fourth and the frieze about one-fifth, of the height

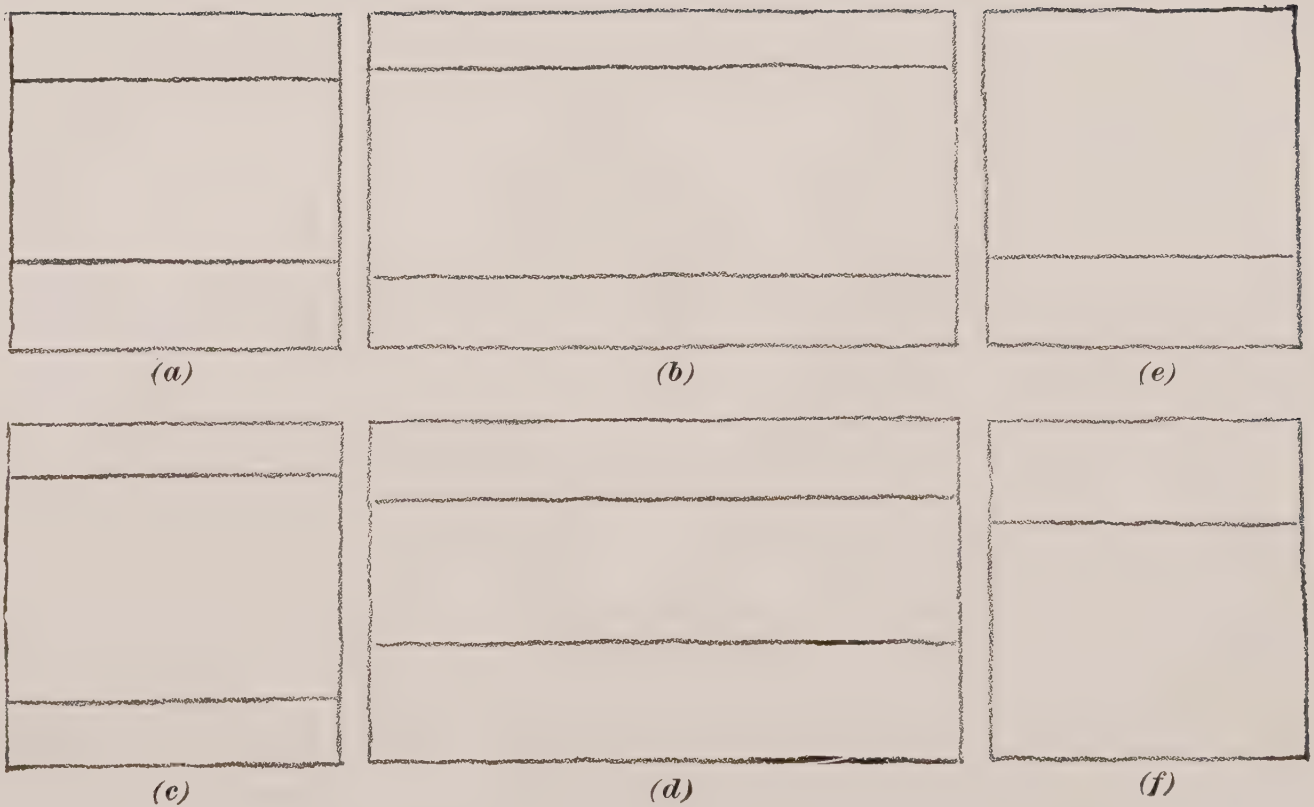


FIG. 1

of the entire wall, this being very near the proportion of pedestal, column, and entablature in the orders, the subdivision shown in (*a*) would not suit the surface (*b*), nor would the subdivision in (*b*) be as satisfactory for the surface (*a*), as shown in (*c*) and (*d*). Therefore, in a long, narrow room where both these conditions exist, a compromise would be necessary.

If the field space is to be decorated with wall painting or with tapestry, as in Fig. 2, it might be desirable to omit the frieze and simply divide the surface into two parts, as shown in Fig. 1 (*e*), which is the subdivision shown in Fig. 2 (*a*), or to increase the frieze and diminish the dado, as in Fig. 1 (*f*), which was done in Fig. 2 (*b*). The fresco decoration being the detail in which the interest centers, the remainder of the wall should be as simple and unobtrusive as possible.

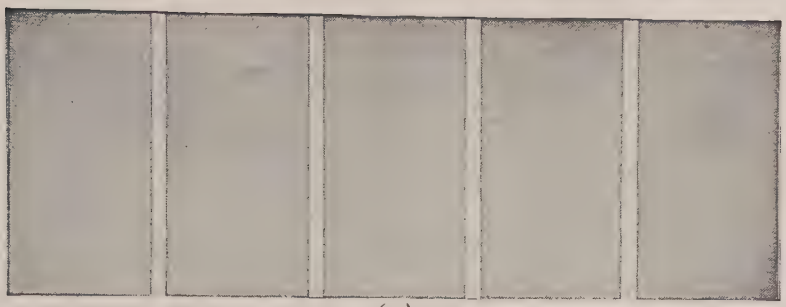
8. The character of the wall decoration, as well as the shape of the wall surface, will also affect the apparent proportions into which the wall may be subdivided. Vertical stripes will make a wall appear higher, while horizontal bands will cause it to appear lower than it really is. Where a wall is long, as in Fig. 1 (*b*), and also so low that a treatment in horizontal bands is likely to prove objectionable, vertical elements may be introduced to divide the surface into individual panels, as in Fig. 3 (*a*), each of which may then be treated as a separate wall. Another plan is to carry a frieze across the entire wall, so as to unite the design, and then divide the under portion into panels, as shown in Fig. 3 (*b*). A third method is to carry the frieze and the dado around the four sides of the room, and then subdivide the field into individual panels, as in (*c*) and (*d*).

While all these methods of treatment are particularly suitable to a long room, care must be taken that a proper effect of ceiling height is attained. Horizontal panels, as in Fig. 3 (*d*), are likely to cause the same depressed ceiling effect as the treatment shown in Fig 1 (*d*), so that the proportion of the panels must in each case be carefully studied.

(*a*)

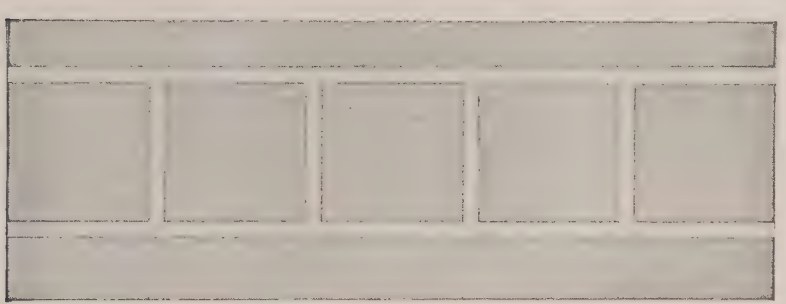
(*b*)

FIG. 2



(a)

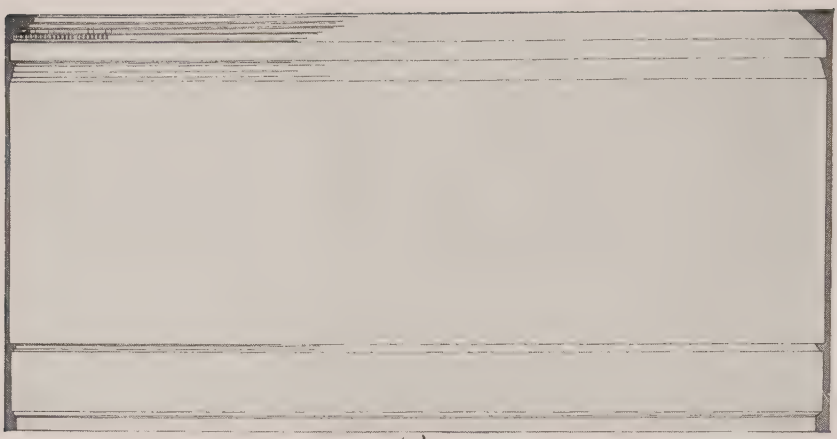
(b)



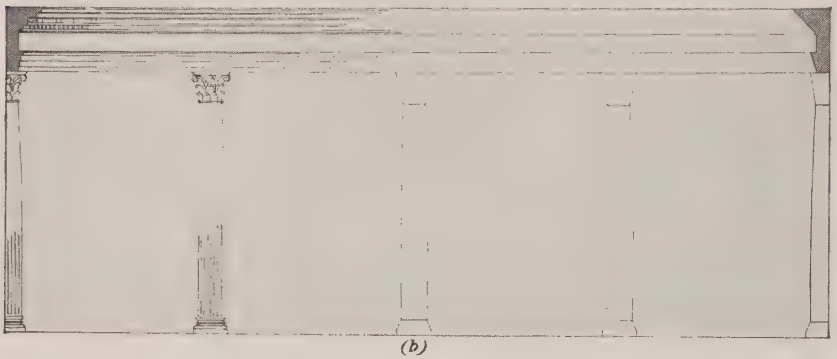
(c)

(d)

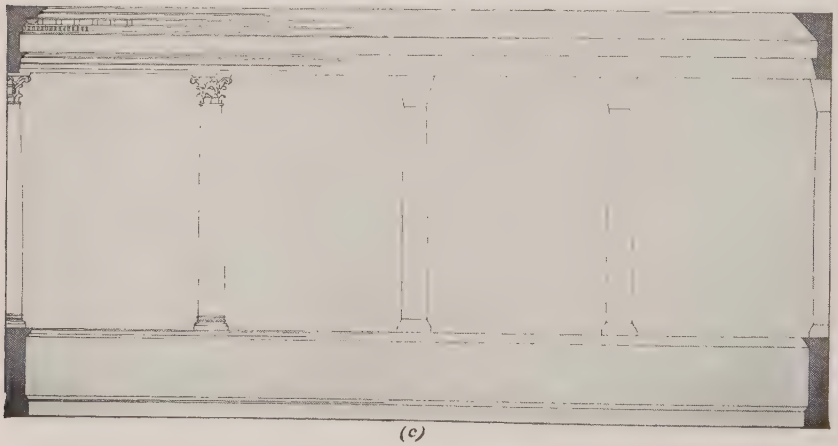
FIG. 3



(a)



(b)



(c)

FIG. 4

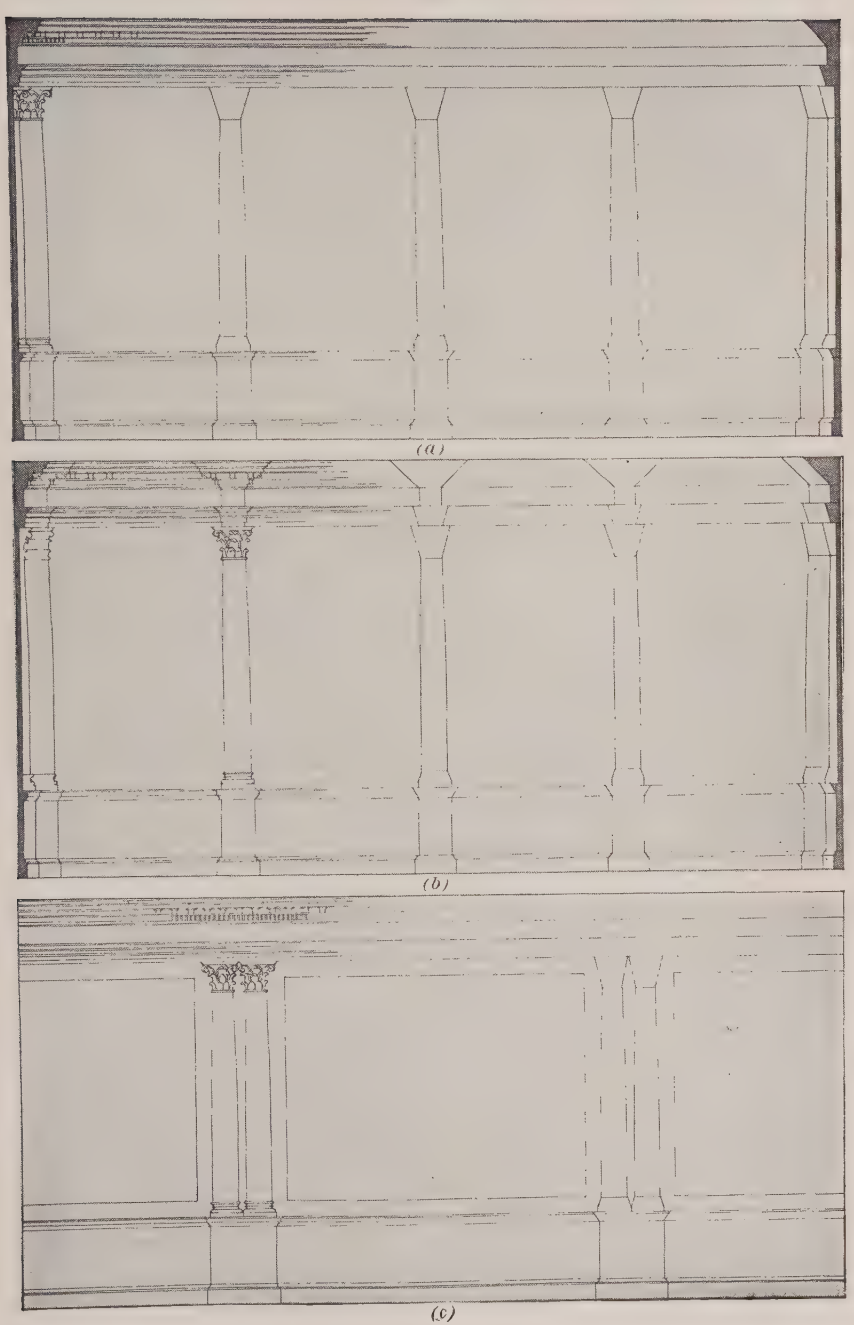


FIG. 5

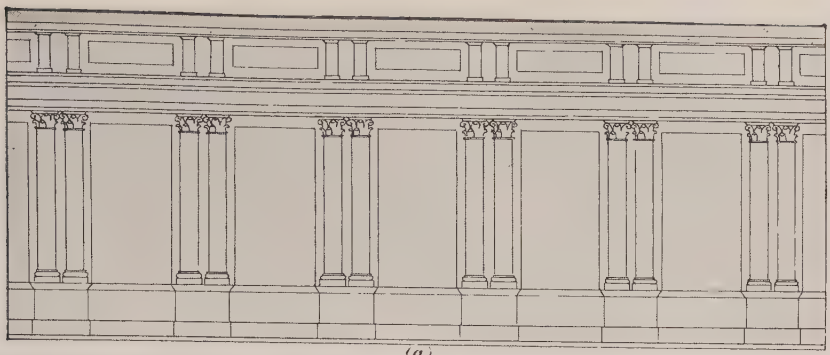
9. With these several fundamental methods of dividing the wall surface, it is possible to attain an almost unlimited variation of treatment before the treatment of the individual divisions—dado, field, and frieze—is considered. The three elementary divisions can be varied as shown in Fig. 1, and the style of decoration then selected according to the proportion decided on; or, if a given style of decoration is preconceived, it will influence the divisions of the surface.

10. The subdivision into three horizontal bands, as in Fig. 1 (*b*), suggests a classic treatment, and a regular molded dado conforming to the pedestal of an order might be introduced with a corresponding frieze in the form of an entablature, as in Fig. 4 (*a*). The vertical subdivision shown in Fig. 3 (*b*) suggests the treatment of column and entablature, as in Fig. 4 (*b*). The paneled field between the dado and the frieze, as in Fig. 3 (*c*) and (*d*), suggests the treatment shown in Fig. 4 (*c*), or a combination of the treatments shown in Fig. 3 (*b*) and (*c*) can be effected by the arrangement shown in Fig. 5 (*a*) and (*b*).

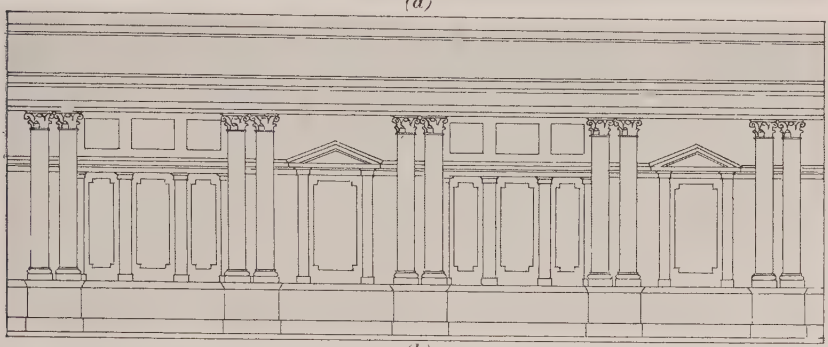
In Fig. 5 (*a*), the general treatment consists of a horizontal subdivision into dado, field, and frieze, the same as in Fig. 4 (*c*), but the vertical subdivisions are carried from the frieze to the floor by breaking out individual pedestals under each pilaster. In Fig. 5 (*b*), the vertical elements are still more emphasized by breaking out the frieze over each column and the pedestals under them. Thus, while the field panels remain the same as in Fig. 4 (*c*), the vertical elements extend from the ceiling to the floor and the apparent height of the ceiling is much increased.

The classic treatment of walls may be further elaborated by using columns instead of pilasters; by coupling the columns, as in Fig. 5 (*c*); by introducing pediments over the openings; or by introducing an inferior order as a decorative scheme in the panels, or bays, between the columns.

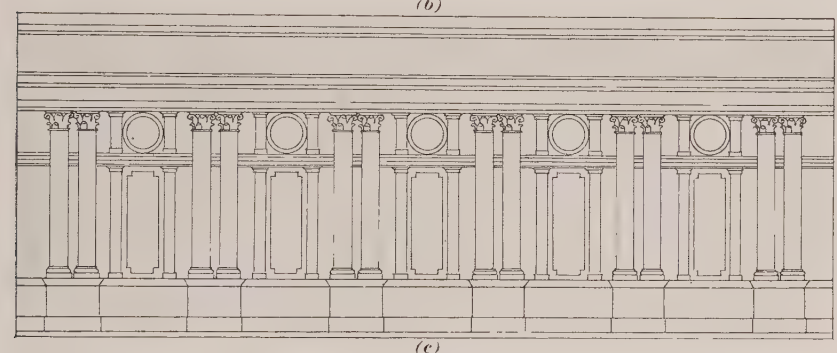
11. In Fig. 6 are shown several variations of the treatment of wall panels separated by columns. The principle involved is the same as in Fig. 4. The subdivision in



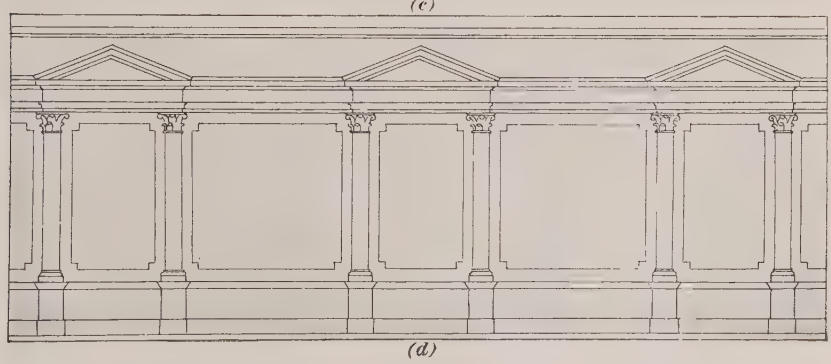
(a)



(b)



(c)



(d)

FIG. 6

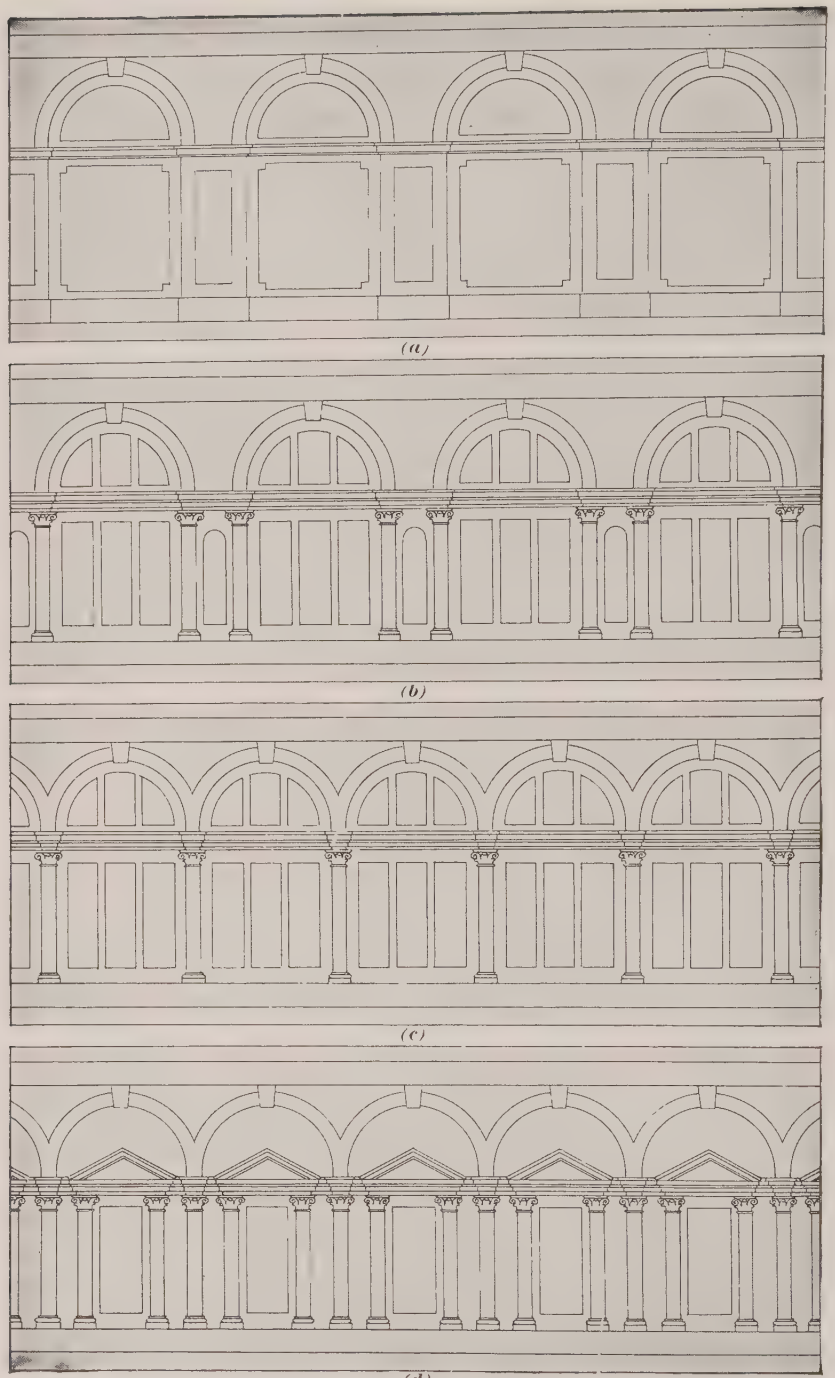


FIG. 7

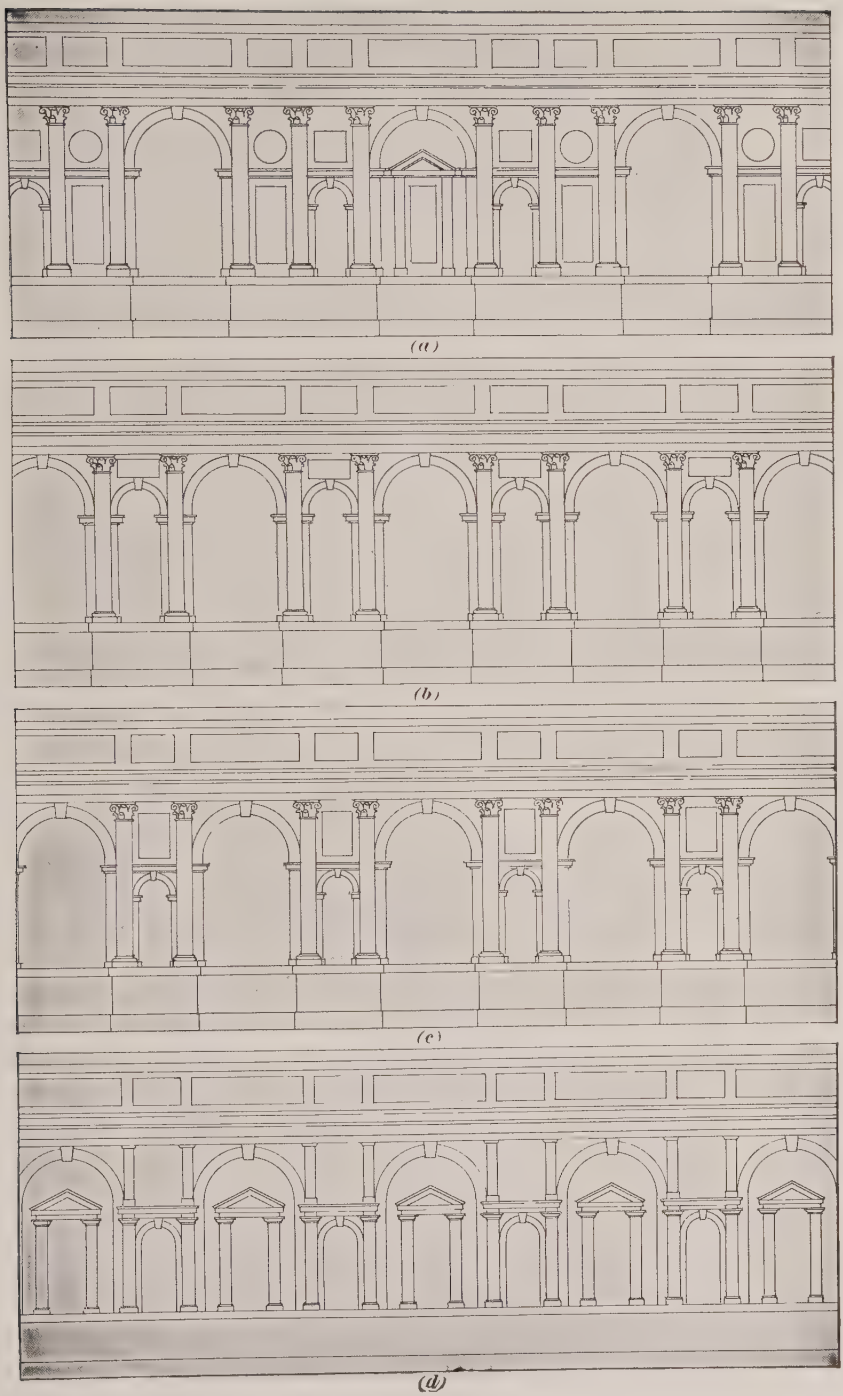


Fig. 8

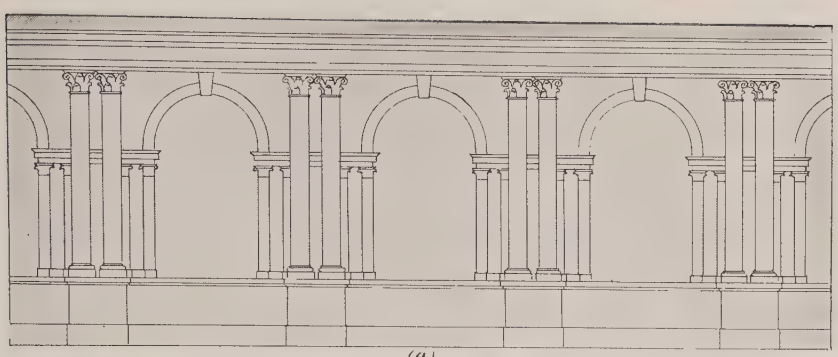
Fig. 6 (*a*) is effected with perpendicular elements consisting of two columns with a single panel between, while in (*b*) a similar treatment includes, alternately, three panels and one pediment over an inferior order. In (*c*), an inferior order is introduced, as in (*b*), with a panel and circular eye above. The treatment in (*d*) introduces a pair of columns with a pediment and a panel enclosed between. These panels might be in some instances windows or doors and suggest a treatment for the introduction of these details in the side walls.

12. In Fig. 7, broad piers, or pilasters, subdivide the walls into panels, over which arches are thrown, introducing circular elements that may be treated as individual panels, as in (*a*), or as groups of panels, as in (*b*) and (*c*). In (*d*), a pediment is used over two columns, while an arch groups the whole.

13. The combination of full orders and inferior arches is shown in Fig. 8, where, at (*a*), the wall is divided alternately by columns into narrow and wider panels, and a circular opening is maintained between. In (*b*), the circular opening is introduced between all the columns, and in (*c*) the general treatment is precisely the same, except that the circular opening between the closely spaced columns is inferior to the opening between the wider spaced columns. In (*d*), a pediment is introduced, thereby rendering the decoration somewhat more complex.

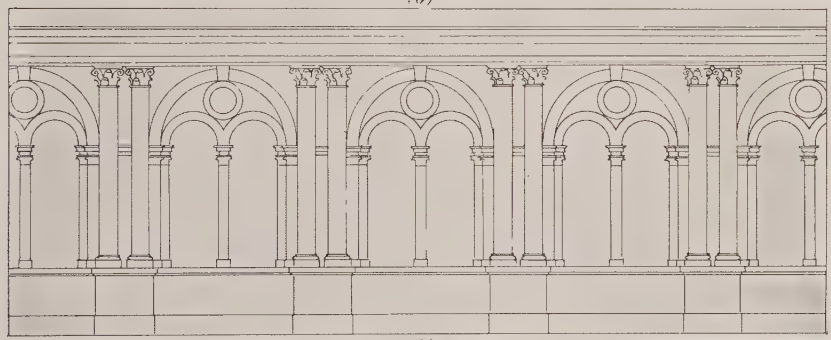
14. In Fig. 9, the columns, so far as the subdividing detail is concerned, are carried out the same as before, but the arches are treated independently, partly with an inferior order, as in (*a*) and (*b*), and partly as separate architectural compositions, as in (*c*) and (*d*).

15. A more monumental treatment, suggested by a combination of the arrangement shown in Fig. 4 (*b*) and that in Fig. 9, is illustrated in Fig. 10 (*a*) and (*b*), but here tall columns are carried from floor to frieze, the space between them being subdivided as shown in Fig. 1 (*a*), and

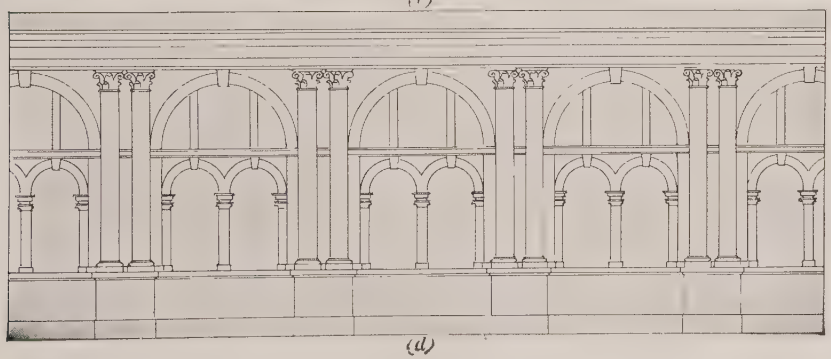


(a)

(b)

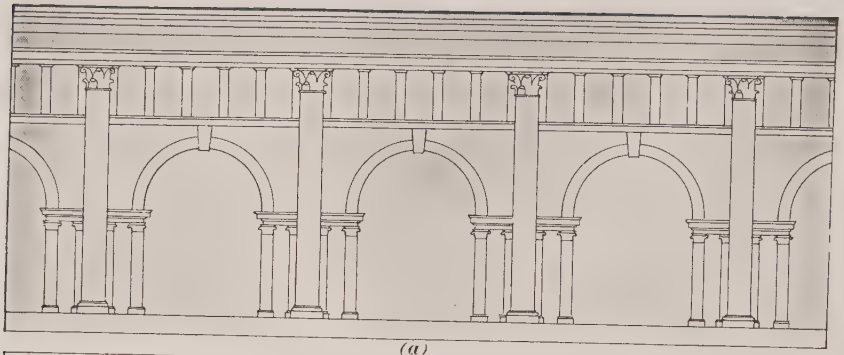


(c)

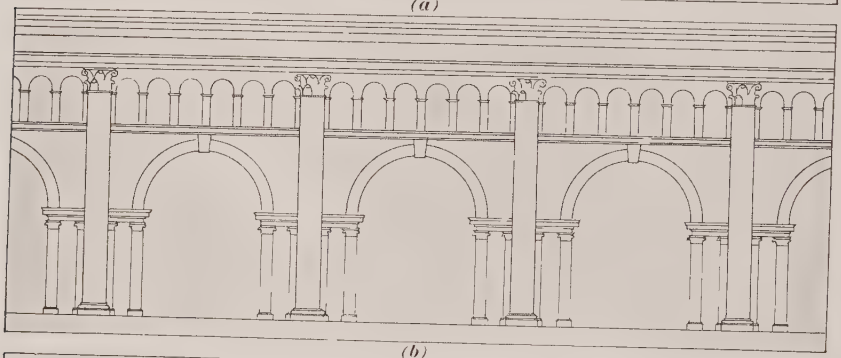


(d)

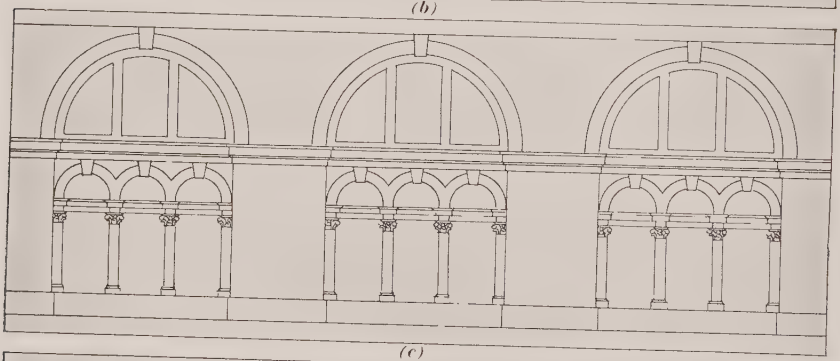
FIG. 9



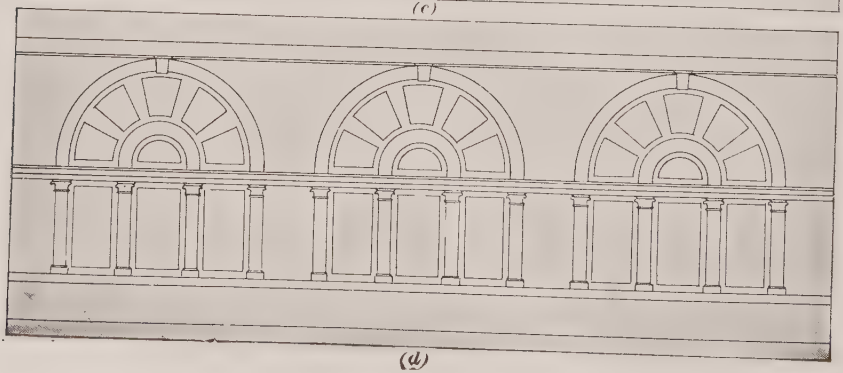
(a)



(b)



(c)



(d)

FIG. 10

the subdivision effected by the introduction of architectural details. These variations of wall surfaces can be carried out for exterior as well as interior decoration, but for the latter subdivision, variety can be effected by a combination of actually existing columns and pilasters, while the wall surface itself can be treated in the flat.

In Fig. 10 (*a*) and (*b*), the columns extend from floor to frieze, and the wall surface back of them is decorated with inferior pilasters and arch moldings run in the plaster; however, a slight variation of the architectural division could be effected in conventional rendering of the interior order and the frieze details against the wall surface. This style of treatment is sometimes found to be convenient in dividing large surfaces in a simple manner, but in treating such surfaces, no attempt should be made to show architectural details deceptively. The treatment should proclaim itself simply a wall painting, and not an imitation of surface decoration in relief.

16. Most of the subdivisions shown in Figs. 6 to 10 are suitable only for large and monumental rooms. A number of details crowded into the small space of an inferior room would only destroy the effect of unity in design. Taken as a whole, any system of design must maintain simplicity, and simplicity can be effected with the preceding combinations only when the room proportions are so great that especially large details will not be out of place.

In selecting a surface decoration or a system of subdivision, therefore, the designer should not endeavor to fit any one of these systems to the room, but should select one that is best suited and that naturally applies to the problem involved.

17. The subdivision of wall surfaces thus far considered is according to the classic system. The Gothic system is diametrically opposite; there is no attempt at symmetry of detail nor any direct subdivision according to given proportions. Therefore, the style of treatment shown in Fig. 3 (*a*) and (*b*) is more suitable for a Gothic scheme, although late

Gothic runs into a balance and symmetry, as in the arrangement of its arcades and exterior details modern Gothic effect is frequently found in subdivision suggestive of balance and symmetry.

Gothic interiors, though frequently executed in stone and marble, are usually characterized by oak panels and wainscot and a wall treatment in diaper work characteristic of the period. All woodwork in Gothic interiors can be made extremely characteristic by giving careful attention to the carved foliation and treatment of the surface, as with window tracery. The pointed arch with cusp and foil are used, and even interior gables with crockets and finials are occasionally introduced. Paneled wooden walls were characteristic of Gothic domestic interiors in all periods, and these can be well worked into Gothic schemes of the present day. The upper walls were usually left bare and hung with tapestry. This scheme can also be carried out at the present time, or these walls may be decorated with fresco.

The student should ever bear in mind that these proportions and arrangements are only suggestions of what can be and has been done. Problems frequently arise wherein something entirely different will suggest itself, and these suggestions should always be tried out to determine their fitness. A room should never be forced to adopt a fixed idea because it is desired that the apartment should have a certain historic style. There are many cases wherein the distribution of window and door openings or the structural subdivision of the sidewalls will not permit of some preconceived decorative idea. In such cases the unalterable structural conditions should be emphasized to form prominent elements in the decorative scheme adapted to the conditions.

In a new building the structural conditions can be carried out with the final decorative arrangement in mind, and each can be made to contribute to the success of the final result. In an old building or an alteration, however, it is often difficult to arrive at a satisfactory conclusion, and the endeavor should be to carry out a scheme with the assistance of the existing structural necessities rather than in spite of them.

MATERIALS

18. Where walls are divided only by horizontal bands, each band may consist of a different material, or all the bands may be of one material, but treated in different ways for ornamentation. In monumental work, such as the lobbies of theaters, public buildings, hotels, etc., marble is the most suitable material for at least a part of the side wall. The dado, or wainscot, may be of marble and the field and frieze of plaster properly decorated; or, the entire wall may be of marble divided into panels by means of pilasters and moldings, as in Figs. 5 to 9. Where either columns or pilasters are used as vertical elements, the pedestals and bases should be of marble, but the filling may be of any suitable material that the conditions require.

For large private dwellings, marble is sometimes used for the main-entrance hall, but fine woods are usually more suitable. The treatment may be either classic and severe in polished marble, or modern Renaissance or Gothic in mahogany, oak, or some other suitable wood. Sometimes, soft and cheaper woods that are painted with several coats of white paint and enameled on the last coat are used. This treatment is particularly suitable for the late English Renaissance, or Georgian, period and for the contemporary American Colonial style, which is similar to it.

19. Oak paneling is characteristic of the Gothic style, being used for the entire side wall or for the wainscot, with a tapestry treatment for the field. Mahogany was used to a great extent in the French Renaissance, particularly in the Empire period, with gilded capitals on the columns and pilasters and much gold appliqué work in the friezes. Tapestries and painted decorations were used in the field, and polished hardwood overlaid with rugs constituted the floor treatment. Generally speaking, however, modern walls are treated with one or more of the following materials: Natural wood, canvas, burlap, silk, leather, paper, painted wood, or painted plaster.

WOODS

20. A characteristic feature of modern interior decoration is the lavish use of wood for columns, beams, ceilings, paneled wainscots, and polished floors. Modern halls, libraries, dining rooms, etc. are frequently paneled with a high wainscot and furnished with built-in bookcases, cabinets, lockers, seats, etc. Each of these wooden constructions must be finished with some sort of stain, varnish, paint, or enamel that will either bring out or hide the characteristics of the grain, and thus make the wood harmonize with the purpose of the room and the style of the decoration. Therefore, in considering the kind of wood that is to be used to secure an interior effect, attention should also be given to the finish that the wood will take in order to give satisfactory results as to service and appearance.

While there is no limit to the number of woods that are available for interior finish, there are comparatively few that need be considered at present. These few, namely, oak, mahogany, maple, birch, ash, and cherry, will serve all purposes of ordinary practice, as the others are used only in localities where the kinds just mentioned are expensive, or where peculiar conditions of design or tradition require their introduction. At the present time, oak, mahogany, and maple enter more largely into the general woodwork decoration of the modern house than any other specific woods. Of course, other woods are used, but more often in imitation of one or the other of the preceding. Oak, mahogany, and maple are never stained to imitate something else, as the grain and the color of these woods are beautifully characteristic in themselves. However, cheaper woods are frequently stained in imitation of oak and mahogany, although the practice is not a good one.

21. Oak is frequently treated with different stains in order to give some particular or historic effect. Thus, for instance, there are antique oak, which is nearly a natural finish; golden oak, a darker finish; and English oak, a very

dark finish. Besides these, more modern finishes provide Flemish oak, mission oak, weathered oak, etc., all of which are simply variations of color in the stain or filling applied to the wood to give it a characteristic effect.

As a rule, mahogany is finished in two styles only—natural finish and old mahogany. In the same manner as oak, birch partakes of a variety of tones according to the stain used; but, owing to the peculiarity of its grain, every effort should be made to use a system of treatment that will bring out its beauties.

Oak is frequently imitated in ash and chestnut, both of which present beautiful grain effects in the ordinary sawing; but neither can compare with oak in the quarter-sawed graining. Ash has a more open grain than either oak or chestnut, but pieces of both ash and chestnut can be selected that will present, under proper treatment, a fairly good counterfeit of oak. Cherry and oak are sometimes stained to represent old mahogany, and the grain in many cases is quite similar. The color, however, is never so rich as the natural wood, and such imitations are to be avoided.

22. The kind, quantity, and finish of all woodwork should always be fully considered when the general scheme of a room is worked up, as each period or style demands separate consideration regarding construction, material, treatment, and color.

The trim of door and window openings being generally of wood, the wall treatment should be made to harmonize with it. The openings may be framed with simple unmolded bands, or they may be treated classically with pilasters and pediments or with simple crowning entablatures. In such cases, the part of the wall underneath the window is paneled as a low pedestal or a parapet. Between the vertical elements, a wooden wainscot is usually paneled in uniform repeating panels or in a series of panels of alternating sizes. The sizes of panels will be governed by the style of the design and the characteristics of the wood of which they are composed. All woods shrink more or less, and small panels

are less likely to show the effects of shrinkage than large ones. With hardwoods, such as mahogany, maple, etc., the panels should be of three thicknesses, with the grain of each turned in opposite directions; the outside pieces being laid with the grain lengthwise, and the intermediate piece, or core, with the grain crosswise. The core may be of a different wood, but the surface pieces should be of the same wood. Panels thus built up will not warp, and the shrinkage or the swelling due to the various conditions of the atmosphere will be slight. Large unpaneled surfaces, such as continuous wainscots, may be built up in this way of three or five thicknesses; they will then withstand severe atmospheric changes.

23. When used for ceilings, wood is usually framed to represent beams and girders with wooden panels between. These beams are usually *false;* that is, they consist of boxes that are either framed under the real beams of the story above or built against them and independent of the structural conditions entirely. The moldings used on such beams vary somewhat with the style, but they usually conform to the architrave or the entablature of an order in classic work or to simple paneled beam work in the Gothic.

Wooden columns more than 6 or 8 inches in diameter are best constructed of staves or a series of vertical pieces that are tongued and grooved together and glued up to form a hexagonal, an octagonal, or some other prismatic form, and then turned to size in the lathe. Solid columns should be bored lengthwise through the center, so that changes in atmospheric conditions will not cause them to split.

Wooden pilasters more than 2 inches in depth should be boxed, and not formed of solid pieces for reasons similar to those just mentioned. Bases of columns and pilasters should be separate, with the grain running horizontally, or they may be mitered at the angles. For small examples, capitals of wooden columns should be carved from solid blocks; in other cases, they should be carved from built-up blocks. Gilded capitals are sometimes executed in plaster or in composition

CANVAS

24. **Canvas** is used for a wall decoration over plaster, when painted decorations are desired. The canvas may be glued directly to the plaster and the decorations executed on it in oil paint, or it may be stretched on frames and inserted in panels, as the case may require. In the latter case, the canvas must be protected on the back, to prevent it from being punctured accidentally. Canvas is also used where a smooth, even surface of one color is required, as it takes paint readily and its texture presents a surface that is very pleasing to the eye.

BURLAP

25. **Burlap** is extensively used for simple residence work and for temporary decorations, such as booths and scenic effects. It can be procured in several qualities and in many colors, including gold, silver, copper, etc. Burlap can be rendered fireproof when necessary, and it presents a most valuable fabric for many simple and inexpensive treatments. Dyed burlaps nearly always fade, and this characteristic precludes their use in apartments that receive much strong sunlight. Some of the colors, however, stand well, but care should be exercised in their selection. The finer qualities make excellent and inexpensive hangings, and can be embroidered or stenciled with diaper patterns and borders.

SILK

26. **Silk** is rarely used except for hangings and furniture coverings, and the heavy brocades are particularly suitable for portières and upholstery. It is very durable and moth-proof, and can be easily cleaned after the accumulation of dust. Silk can be obtained in unlimited colors and patterns, and for auxiliary furnishings can be used with any style of art. As a surface decoration, silk is not to be recommended, except for the most delicate treatment of specific rooms. When attached to walls, it is hard to apply, difficult to clean, and shows dirt spots and finger marks very plainly.

LEATHER

27. Leather is used extensively for upholstery and side-wall treatment in libraries, billiard rooms, smoking rooms, cafés—apartments where a certain amount of ease and relaxation is permissible. It is applied in its natural form and color in some cases, or it is embossed and richly decorated in panels in other cases. Leather is durable and sanitary, can be easily cleaned, and lends itself readily to irregular surfaces.

A substitute for leather, known as *Pantasote*, can be obtained in many colors, and for wall treatment it is almost as satisfactory as leather itself. Being a manufactured product, pantasote can be obtained in much larger sizes than the hides of animals. It is even more durable than leather, is acid-proof, non-combustible, and unaffected by water, and lends itself well to yacht and boat-house decoration.

PAPER

28. Wall paper is probably more used for wall and ceiling decoration than any other material. It can be obtained in rolls varying from 18 inches in width, in American manufacture, to 22 inches in width, in foreign manufacture. The cost of wall paper varies from a few cents to as many dollars per roll, and this material is suited in design to every class of apartment except those in which crowds assemble, as rough usage would tend to wear or deface it. Wall paper is manufactured to imitate each of the materials that have been considered, and where an imitation is permissible, it presents a counterfeit that is hard to detect. Wall-paper designs can be obtained that correspond with every style and period of architecture, and in combination with other materials, it can be used with great economy to obtain satisfactory results.

The simplest wall paper is plain ingrain, or cartridge, paper, which is manufactured in rolls 30 inches wide, and in plain shades and nearly all colors. This kind of wall

25

FIG. 11

paper lends itself well to a room in which a figured paper would be out of place, and it can be stenciled or decorated in water color to secure an unlimited variety of effects. It is sometimes used as the basis of a printed paper, thereby furnishing at once the combined softness of the ingrain surface and the stenciled or stamped decoration.

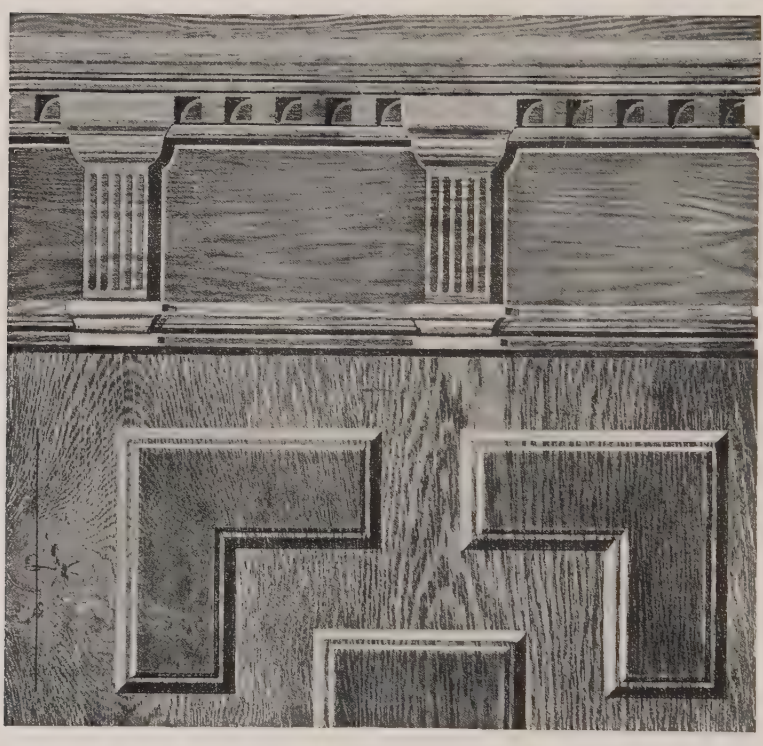


Fig. 12

Printed wall papers present such a variety of designs and such a change of style from year to year that the latest style books must be consulted to learn what is in vogue. The examples here given are only a few of many styles put out by various manufacturers, and have been selected to illustrate the variety of style that the market affords.

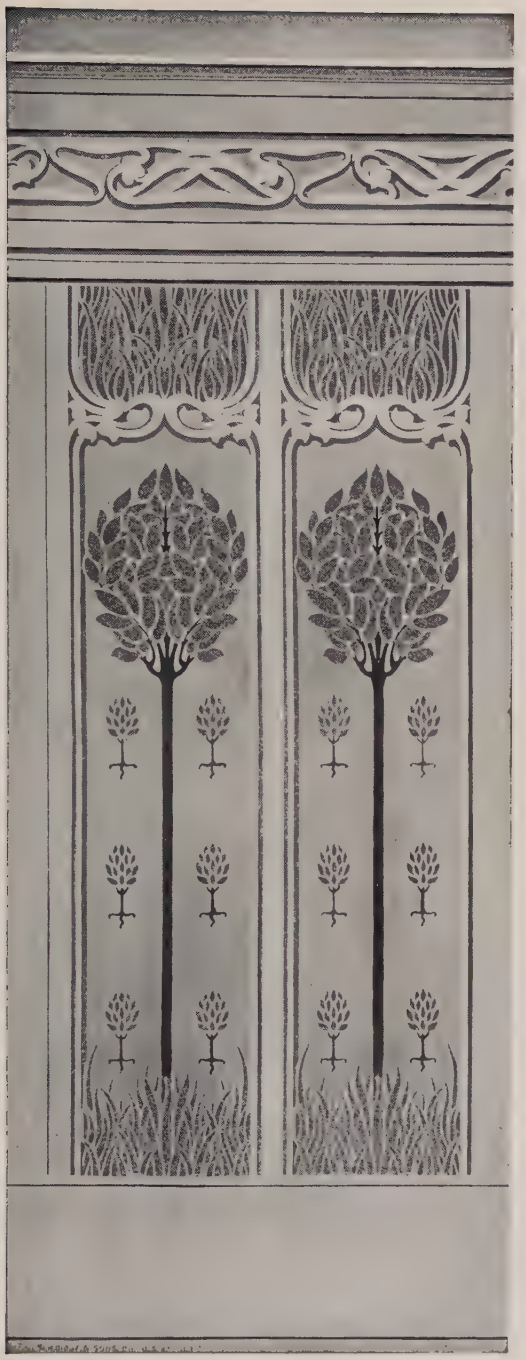


FIG. 13

29. Imitation of Wood Paneling.—The example shown in Fig. 11 is an imitation of wood paneling in antique oak. The use of this style of paper is limited to positions and conditions where such an imitation is permissible. With the light falling on the wall from above and to the left,

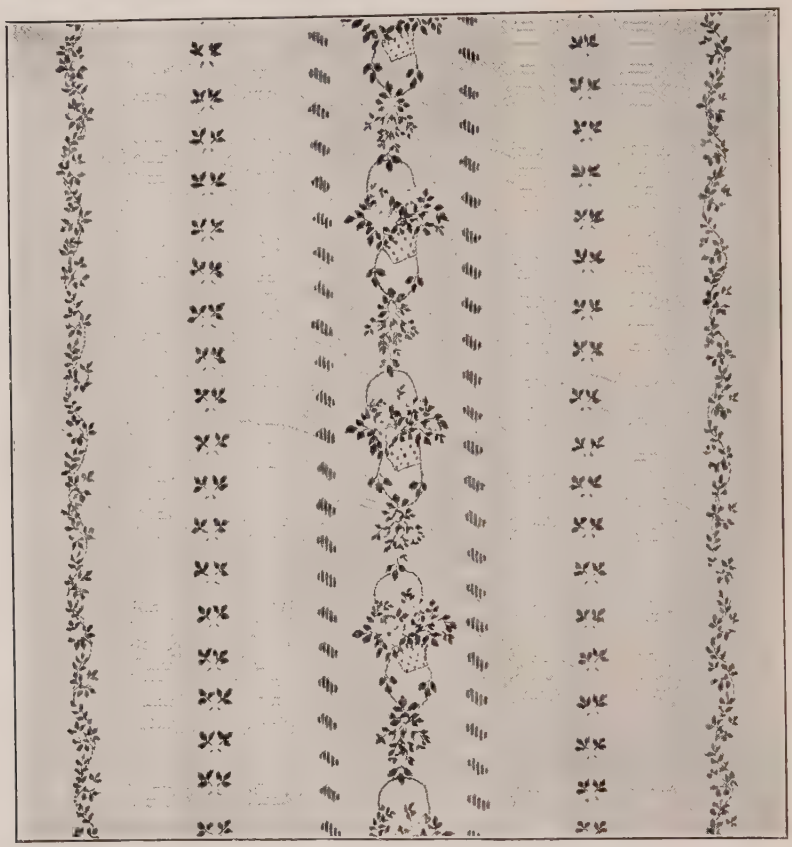


FIG. 14

this paper presents the appearance of raised panels against a flat ground, whereas, by inverting it, the appearance of sunken panels with raised stiles and rails is obtained. In the former position, the crown shown in Fig. 12 is used as a finish at the top, but in the latter position, another style of

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Fig. 15

Fig. 16

Fig. 17

crown and a base is necessary. This paper is faulty in design, however, as the structural conditions are false. The grain of the rails runs vertically across them, whereas, in actual framed paneling, the grain should be horizontal in the rails and vertical in the stiles. It is suitable only for a dado treatment, and another paper would be required for a field design.

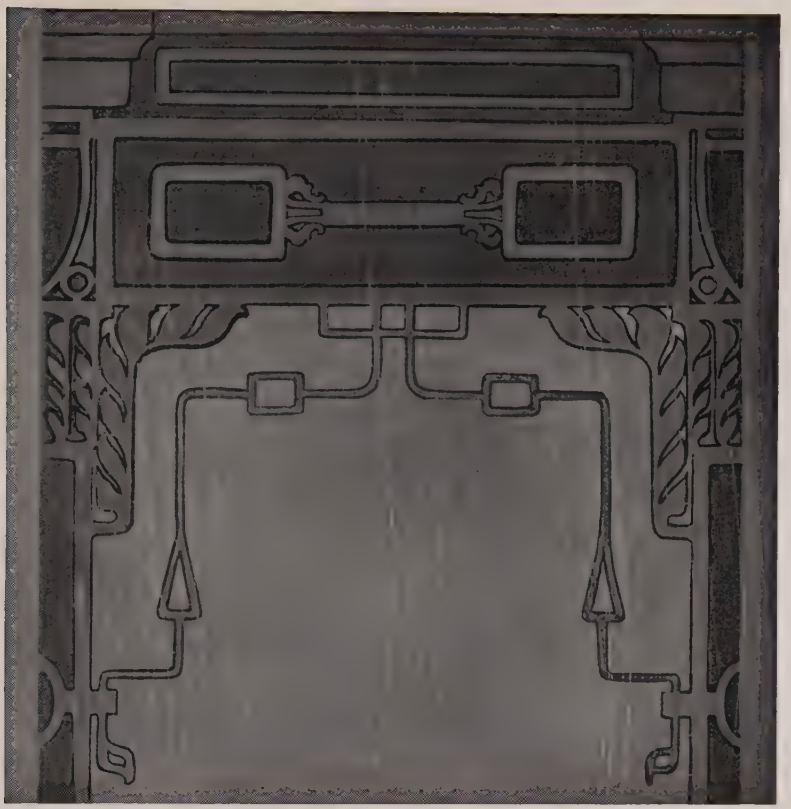


Fig. 18

30. Imitation of Canvas, Etc.—Another dado design, suitable for a stencil decoration on canvas, burlap, or ingrain, is shown in Fig. 13. The treatment in this design is extremely conventional, and in the example shown was executed in several shades of green.

Fig. 19

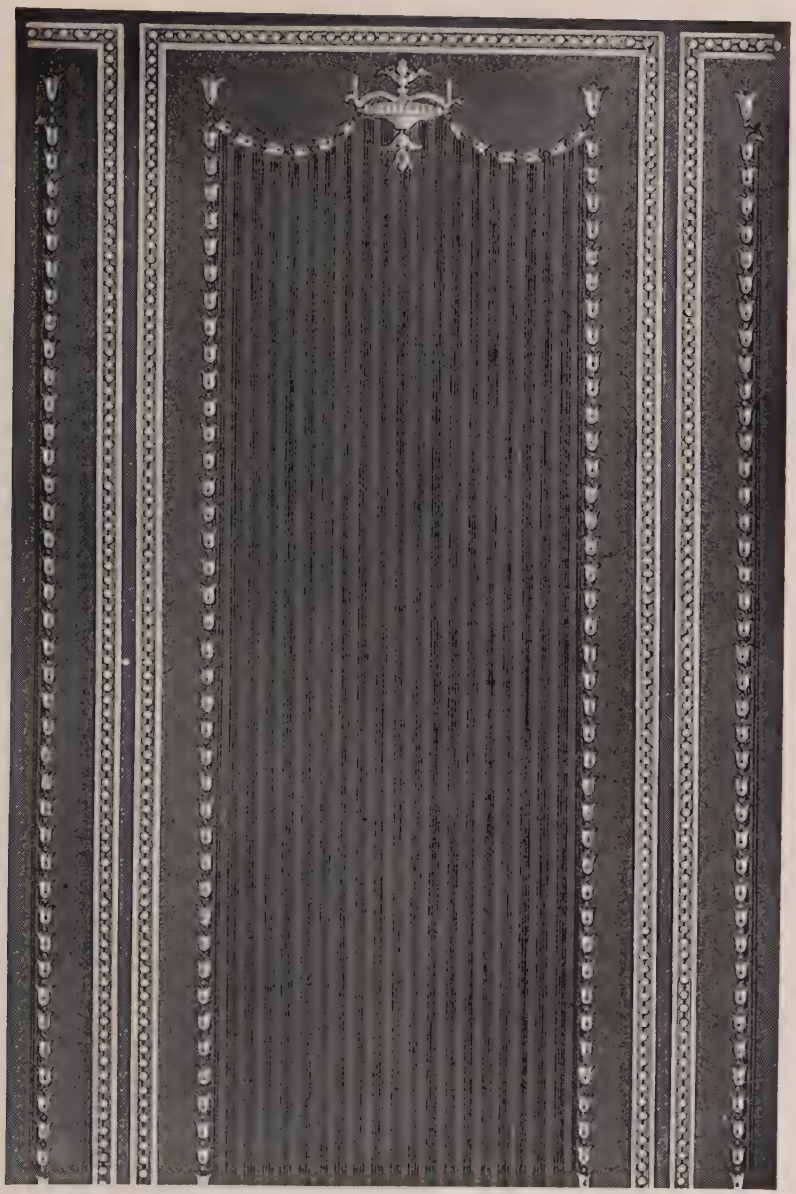


FIG. 20

31. Imitation of Silk.—A silk-brocade effect is shown in Fig. 14. This design was made up from an actual piece of old silk, and shows the silken texture of the background in creamy white, with the flowers and leaf-effect embroideries thereon in reds and greens. This style of wall paper is suitable for bedroom treatment, but should always be included under a frieze, as the effect of stripes from floor to ceiling is very unsatisfactory.

32. Imitation of Leather.—Designs in imitation of leather are shown in Figs. 15 and 16. Each of these is worked on a very heavy paper, with the design deeply stamped, as in embossed work. The characteristic markings of the hide are also impressed in the surface of the paper, so that the imitation is very deceptive. For a lounging room or a den, the paper shown in Fig. 15 is very effective, and it lends itself to an Oriental and luxurious treatment with plenty of brasswork and Eastern implements in the accessories. The design of the example shown in Fig. 16 is more conventional but less suggestive of historic style; however, it is equally adaptable to decorative schemes of the L'Art-Nouveau or the arts-and-crafts school of design.

33. Examples of Simple Wall-Paper Treatment. The following designs are examples that are not imitations of other materials, but rather examples of simple wall-paper treatment. Fig. 17 shows the central portion of a simple panel design that can be cut to any length and finished, top and bottom, with the crown and foot-piece shown in Fig. 18. It is a conventional design in three shades of olive green, and is appropriate for a hall, a library, or a dining room that is to be decorated in the craftsman's style of treatment.

34. Simple stripes in two shades of blue, buff, or pink often provide a suitable treatment for a small reception room, particularly where the ceiling is low and a deep frieze cannot be considered. In Fig. 19 is shown a combination of this character, in which the stripes are laid first and the crown effect is applied above. The stripe effect can be varied by subdividing the wall into panels, as in Fig. 20,

and if a deeper crown is desirable, additional designs can be obtained, as shown in Fig. 21.

35. A simple conventional design, with heraldic devices, is shown in Fig. 22. This paper is printed in four shades of the same color, and is suitable for a side wall over a plain ingrain of the same tone as the ground color, on which shields, crests, spot patterns, or other suitable devices may

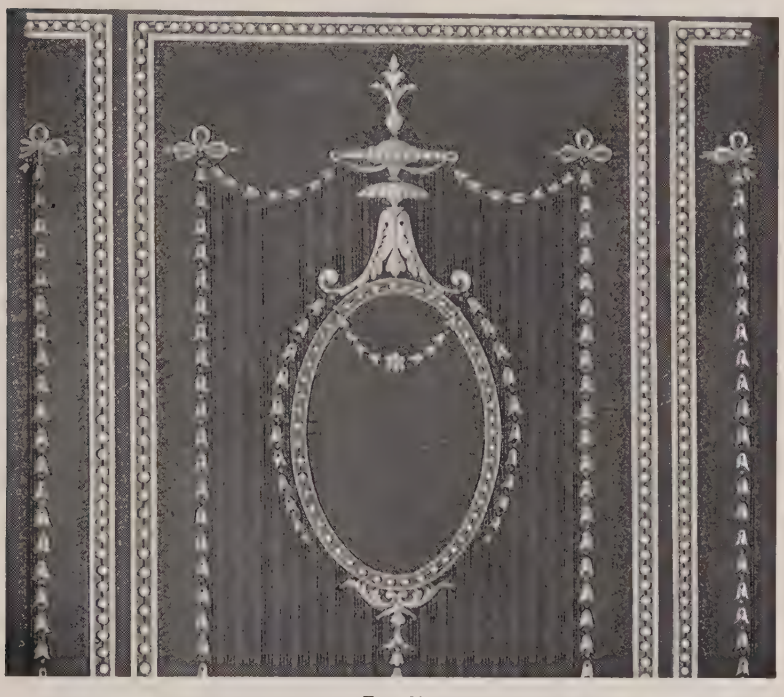


FIG. 21

be stenciled in a spot pattern. Simple tapestry effects may also be used under this design as a field filling, or, in some extreme cases, the panel device shown in Fig. 10, with the frieze omitted and the panel work carried out symmetrically at top and bottom, may be employed. The frieze is appropriate for a modern Gothic interior or an adoption of the craftsman style.

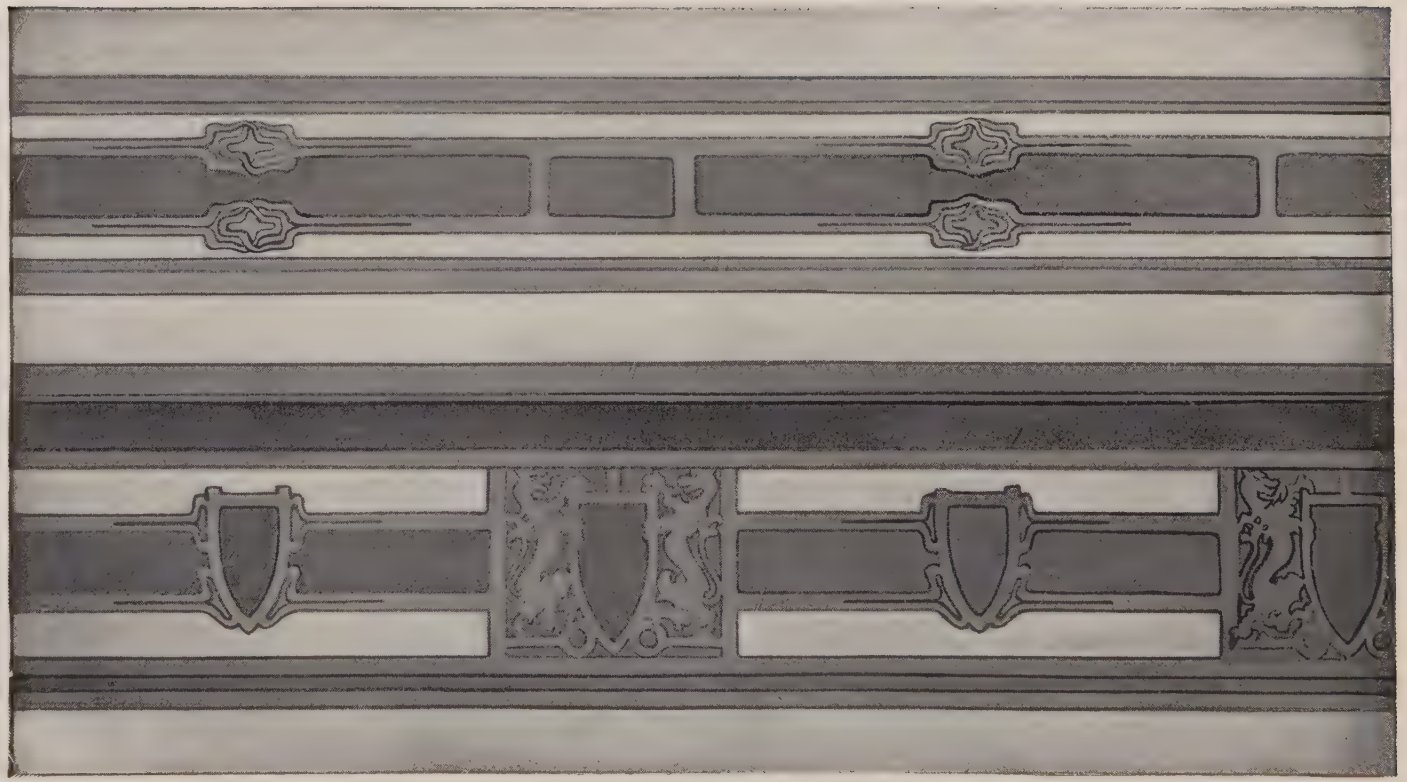
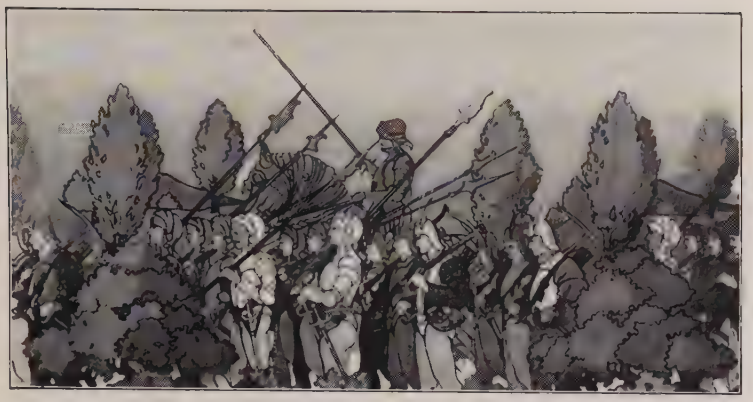
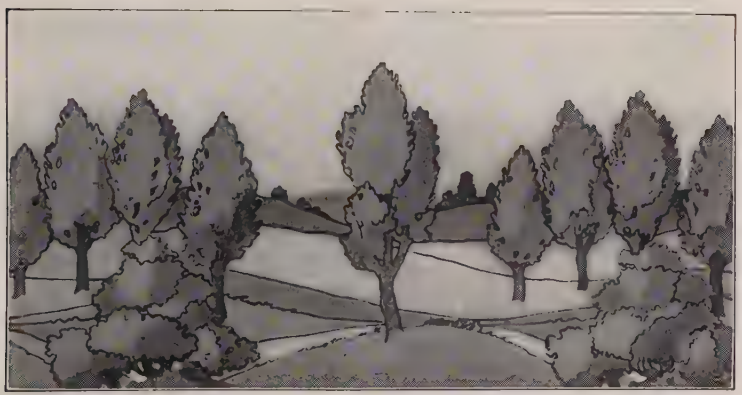


FIG. 22



(*a*)

(*b*)



(*c*)

FIG. 23

36. Another design suitable for a Gothic room is the frieze shown in Fig. 23. This design is made in three sections, so that variety can be obtained as the procession of Crusaders is seen from different points in the room. These sections can be united so as to make the groups of figures

(*a*)

(*b*)

FIG. 24

vary in number and extent with sections of conventional landscape between, or the landscape section can be repeated with another landscape piece that is designed to fit it, so that the figure groups may occur only once or twice in a room frieze, or even be omitted entirely. With skilful handling,

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Fig. 25

I L T 100 § 49 (a)

(b)

many different combinations can be effected that will afford a variety of design with any of the simple repeating friezes.

37. Another frieze design based on a similar principle, but of a more frivolous nature and therefore more suitable for a nursery or a child's room, is shown in Fig. 24. As in the previous designs, there are other sections that can be fitted in between the ones shown in (*a*) and (*b*). These will permit the landscape or the procession of geese to be extended, and thus make it possible that the entire frieze shall be of either subject by itself, with the other as an incident here and there.

38. A most ingenious design, with a crown effect instead of a frieze, is shown in Fig. 25. The hanging consists of a naturalistic rendering of swamp grasses in a tangled growth that completely fills the field. Over this design, two crowns are hung, the one shown in Fig. 26 (*a*) providing the tops for the grasses and introducing a pair of flying ducks, and the other, in (*b*), simply topping out the grasses. When arranged judiciously, this design makes an attractive decoration for any of the public rooms of a country club or it may even be used in a mountain bungalow.

APPLICATION OF MATERIALS

39. When the subdivision of the wall surface is determined upon, the material to be used for the filling should also be considered, for it is necessary to have in mind what is to be used between the columns or the pilasters when these details are to be used as vertical elements of division. Panels thus formed should be filled with severely conventional designs or with plain color, as they are likely to be partly relieved by pictures, and an obtrusive design would detract from the decorative value of the pictures themselves. The materials best suited for this purpose, where marble or wood paneling is not to be considered, are burlap, canvas, leather, ingrain paper, or painted plaster, any of which may be stenciled with a simple diaper or a spot pattern if desired.

When the subdivision is effected in the "flat," without projection pilasters or columns, certain combinations of wall paper, which will be given in detail can be adopted.

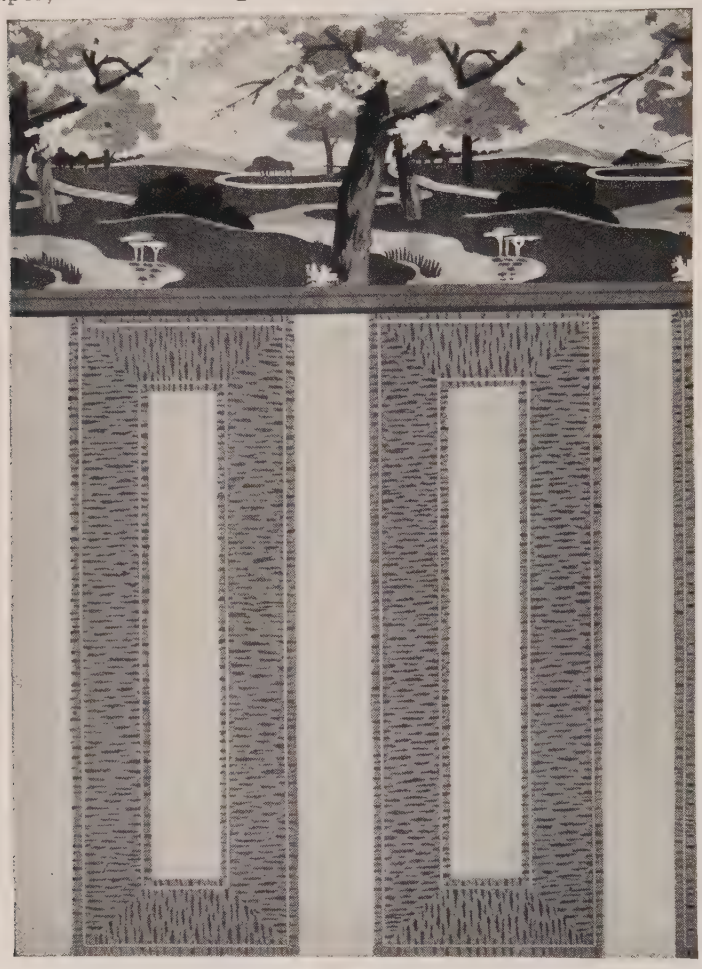

FIG. 27

40. For the subdivision suggested in Fig. 1 (*a*), a stock frieze and hanging, with a ceiling paper to match, may be used over the dado. The dado may be either of wood or of ingrain paper with a wooden rail about the height of a chair

back along the top. This wooden rail protects the wall from injury when furniture is pushed back against it, and is known as the *chair rail*. In bedrooms and apartments having low ceilings, the dado should be omitted and the hanging carried from the baseboard to the frieze.

41. For the subdivision shown in Fig. 3 (*a*), which rarely occurs, panels can be formed of such designs as those shown in Figs. 15, 16, 17, 18, and 19. These designs are suitable for a low ceiling, where there is little or no room for a frieze.

42. For the subdivision shown in Fig. 3 (*b*), any of the frieze effects previously described can be used in connection with a field of any suitable material hung in panels to the baseboard. A suggestion for this would be to use the frieze shown in Fig. 22 with panels composed of the designs shown in Figs. 17 and 18. These were designed to be used in such a combination or to be used separately, as desired.

It is not necessary, however, to use only stock-panel designs for the field. The decorator can work up many unique effects by using stock stripes and cutting them to form panels under a suitable stock frieze, as shown in Fig. 27. Where a conventional landscape frieze is used over a plain, striped ingrain paper, pieces of the dark stripe may afterwards be cut out and inserted both at the top and at the bottom to form panels. Almost any stripe can be used in this way if a little ingenuity is exercised to fit it to the style and conditions required.

43. For the subdivisions shown in Fig. 3 (*c*) and (*d*), any of the foregoing designs can be used over a suitable dado of wood or over a chair rail that is filled below with plain paper or with burlap. A figured paper for the dado is not to be recommended except where the field is left plain and the frieze is omitted, and even then it should be of a strongly conventional and somewhat structural character. Large square panels and oblong panels, such as are likely to occur in these subdivisions, can be formed of figured paper and a

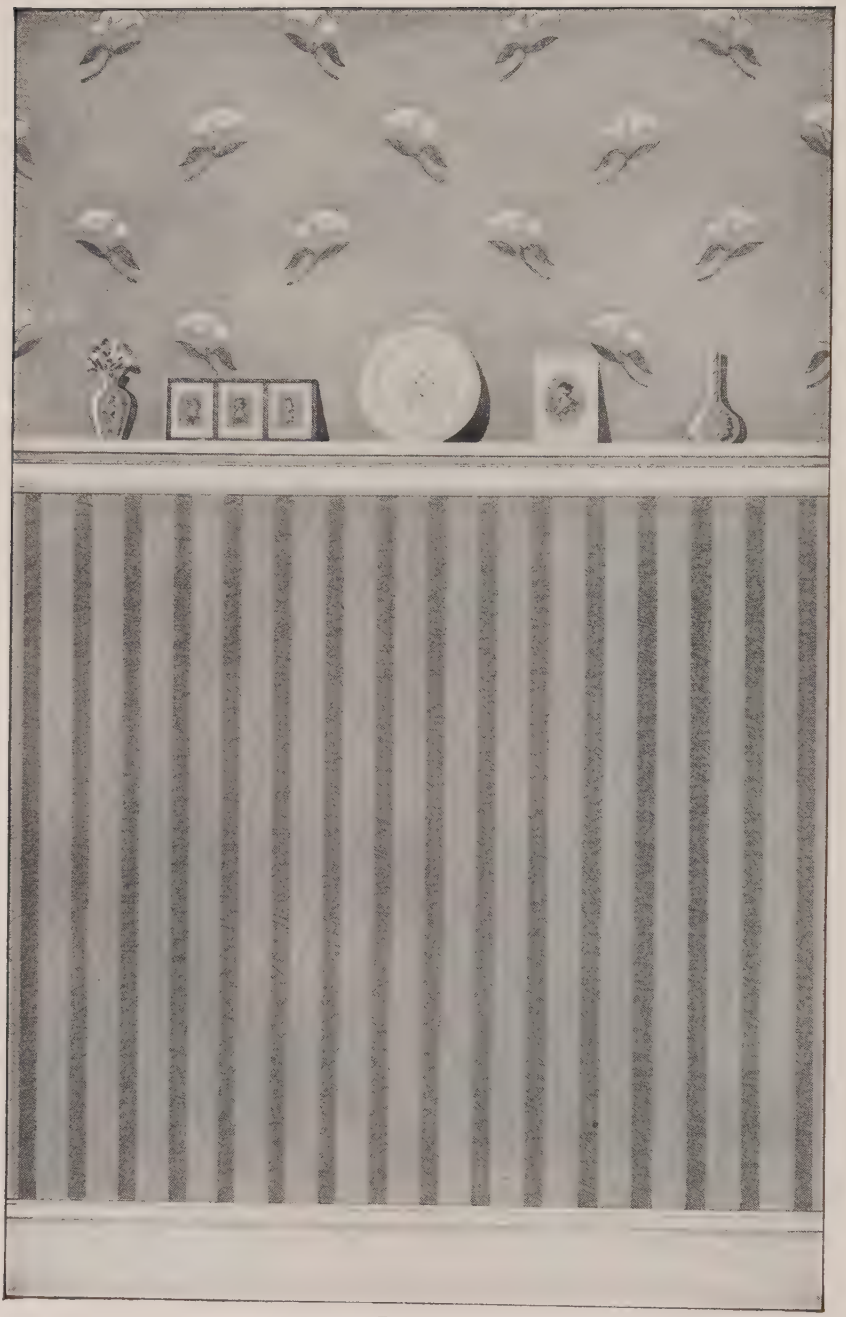

FIG. 28

FIG. 29

suitable figured border, but it is difficult to fit a frieze to such a design.

In any of the subdivision schemes shown in Fig. 3, a prominent molding should be placed at the top of the field. This is usually termed the *picture molding*, as it is from this molding that pictures are suspended by means of brass hooks and wire.

44. For the subdivisions shown in Fig. 1 (*e*) and (*f*), a variety of treatments are possible, each depending on the proportion existing between the upper and lower sections of the wall. A common treatment for bedrooms is to divide the wall one-third from the top and then paper the upper section with a large figured floral pattern, and fill the lower portion with stripes, as shown in Fig. 28, or with a plain burlap or an ingrain, if the height of the ceiling will permit. In either case, the two sections should be separated by a prominent picture molding or a plate rail.

A *plate rail* consists of a shelf from 4 to 6 inches in width with a picture molding below, as shown in Fig. 28. The shelf may be used to support small pieces of bric-à-brac, etc., but no pictures should be hung above it. The plate rail is usually grooved near its outer edge, so as to catch the rims of plaques, or plates, supported on it, from which it derives its name.

45. Another treatment for these subdivisions is to divide the wall about one-third from the bottom, and then paper the lower portion with a design similar to that shown in Fig. 13, and hang the field with plain ingrain to the ceiling. In these subdivisions, fresco or wall-painting treatment in the upper part, with a dado of marble or paneled wood below, may also be resorted to.

46. A combination of the panel treatment suggested in Fig. 1 (*b*) and the one-third division in Fig. 1 (*e*) can be satisfactorily attained by papering the entire wall with an ingrain and then fastening over it wooden battens, or stiles, to form panels under a wide shelf, or plate rail, as shown in Fig. 29; or, the stiles may be built in on grounds made flush

with the plaster when the house is built and the wall surface papered in between them. The former treatment lends itself to the decoration of an old room, while the latter would be the method to follow in a new building. This scheme of decoration is suitable for a library, a dining room, a studio, or a den, and is inexpensive and very effective. If desired, the upper part can be treated with a frieze paper showing heraldic devices or Gothic figures, such as those shown in Fig. 23, or the panels can be filled with leather patterns, such as are shown in Figs. 15 and 16.

This scheme of wall treatment shows that even the simplest ideas can be worked out to result in a most satisfactory manner without involving much, if any, more expense. The few extra dollars required for the woodwork would be offset by the money saved through the omission of a more elaborate paper on side wall and ceiling. An endless variety of subdivisions can be attained by this simple use of battens and a decorative scheme based on this idea can be made as inexpensive or as costly as the designer may desire. The idea should not be looked upon as a cheap subterfuge, as the decorative value of the design depends on the artistic handling of the details, and not on the value of the materials.

The substitution of quartered oak or mahogany would run the cost up and at the same time require a more elaborate fabric for the panels and frieze. The battens could be treated as pilasters with molded capitals and bases. This would change the character of the projecting shelf and with the other dependent details an ornate and expensive composition would result. Thus, while it can be seen that a simple idea can be worked up as an inexpensive or a costly design, it should ever be remembered that the elaborate composition of pilasters, columns, pedestals, and entablatures should never be attempted with the simple, inexpensive materials. An elaborate design rendered in the most inexpensive materials will always look cheap, while a simple design in the same materials will always appear suitable and proper; and a simple design in expensive material will be dignified and luxurious.

DESIGNING

47. It should be understood from the beginning that designing does not consist simply of drawing, nor does drawing by itself consist in any way of designing. There are many designers that cannot draw well, and a greater number of draftsmen that cannot design successfully. Therefore, the man that can both design and draw has very much in his favor.

In order to work up a scheme for interior decoration it is necessary to have a mental conception of the materials and the treatment that must be given them to suit the conditions of some particular apartment; that is, the subdivision of the wall, the treatment of the wall spaces and openings, the introduction of furniture and accessories, and the color scheme, must exist as a whole in the designer's mind before the drawing is started. The drawing then becomes simply a means of communication by which the designer expresses his idea to others. If the idea can be expressed verbally or in writing, a drawing is unnecessary.

For instance, suppose that a room is to be trimmed around the doors and windows with a 6-inch architrave, that a 9-inch base, all painted white, is to be carried around the four sides, that the walls are to be covered with green burlap, and that a picture molding is to be run 18 inches below the ceiling. No drawing would be required for such a scheme, as it is so simple that the description is sufficient. However, if a room is to be in white enamel, with wooden wainscot half way up, the chair rail $3\frac{1}{2}$ feet from the floor, and bookcases built in the height of the chair rail, these cases to have openings about 18 inches wide, with four shelves each, upper walls to be covered with green ooze leather, stamped in gold, doors to be mahogany, etc., then the description is so elaborate that no idea can be obtained from it, and a drawing or a sketch is necessary. Such a sketch is shown in Fig. 30. This is not a working drawing, but simply a pictorial representation of the decorative scheme.

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Fig. 30

48. Drawings for interior decorative designs are of two kinds *pictorial* and *practical*. The former kind is usually a sketch drawn to scale and rendered in pencil, in pen and ink, or in color, for submission to the owner, or patron, so that he may form an idea of how the scheme will work out. The practical drawings are working drawings made for the craftsmen, so that they can properly carry out the idea. The working drawings for the room shown in Fig. 30 would consist of a set of scale drawings for the woodwork, including full-size profiles of all the moldings, and a drawing to scale of the stamped-leather filling.

The designer should be familiar with the net cost of all the materials that he makes use of, and also with the cost of their decoration and application. The first cost mentioned can be learned only by experience, as the prices vary from year to year and in different parts of the country. A collection of catalogs of all manufacturers of interior-decoration materials should always be on hand, and these should be consulted before any scheme that is limited in price is worked up. The cost of labor can be estimated only from actual knowledge of the time required to execute a certain kind of work.

49. When the designer is called on to prepare sketches for a decorative scheme, whether it be for a few rooms or for an entire building, he should learn at once about how much money the owner proposes to spend for it. He should then subdivide this amount into separate items for each room, according to its importance, and confine his design within these figures. If the owner desires more elaboration, he should at once be informed as to the approximate additional expense, in order that the responsibility for the excess may rest with him and not with the designer. It is a serious mistake for the designer to prepare sketches for a scheme that is far more expensive than the owner desires, and then, after their approval, be compelled either to ask for an additional appropriation or to cut the design down in price and detail in order to carry it out. A reputation for executing

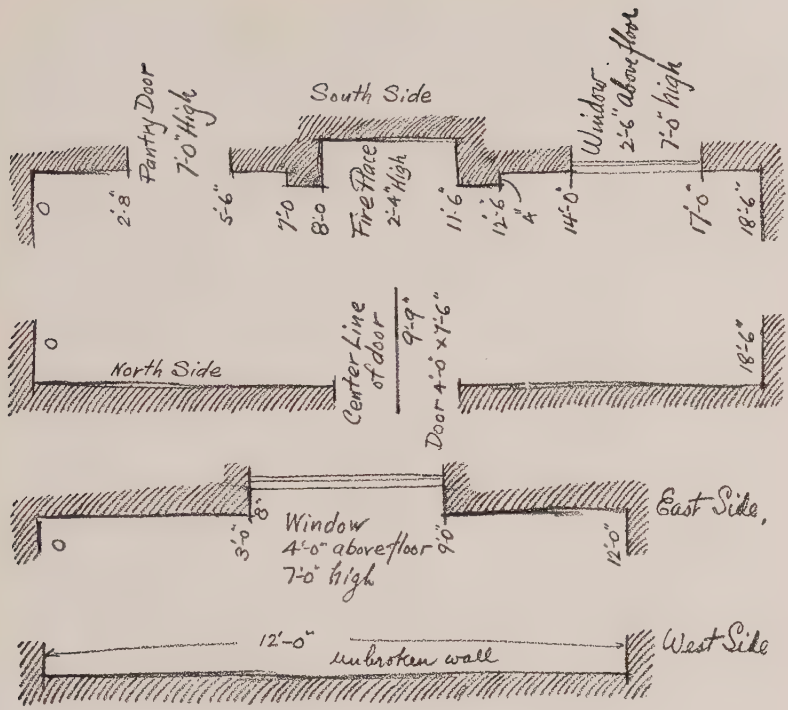
work within the prescribed price will retain patrons for the decorator, whereas an experience to the contrary will cause the patrons to seek another designer when a new job is to be given out.

MEASURING UP

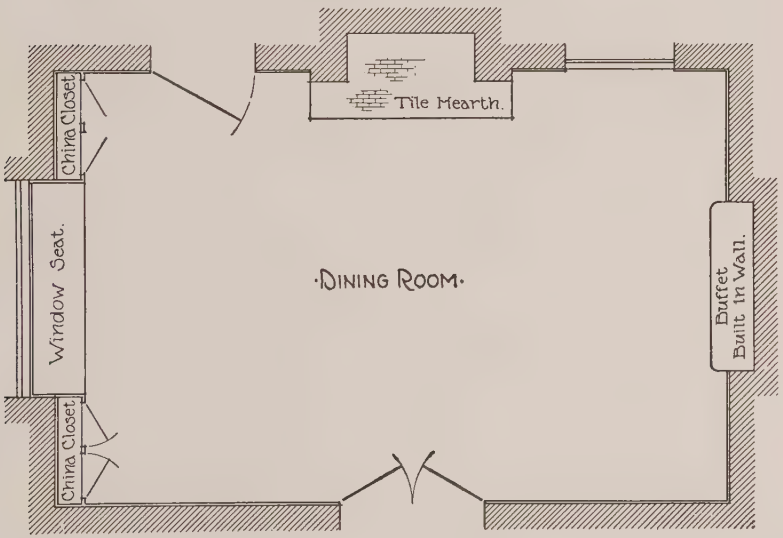
50. The first step after securing an order is to get the exact drawing of the rooms to be decorated. For the preliminary sketch, this drawing may be taken from the architect's plans, but for the working drawings, the building itself should be measured. This is necessary, as many slight changes are made during the process of erection and the finished structure rarely corresponds exactly with the figures on the plans. A variation of an inch is often a serious obstacle.

51. In measuring a room, commence at one corner and measure continuously across the side with a 25- or 50-foot tape, recording each projection or recess as it is reached and noting the width of trim, etc. around windows and doors, where such trim is built in before measurements are taken. Do this with all four sides of the room, and then measure the ceiling height, the size of windows and doors, and the height of the windows above the floor. Make a special note of chimney breasts, fireplace openings, bay windows, location of gas and electric fixtures, water supply, etc. A survey of a single room after such a system of measurement should be about as shown in Fig. 31 (*a*), each side being recorded separately. All measurements of less than 2 feet should be recorded in inches (thus, 16″, not 1′ 4″). Care in the observance of this rule on all occasions will avoid errors in reading the survey after it is made.

52. After all measurements are taken and all information is recorded, a scale plan of the room should be laid out as in Fig. 31 (*b*), and on this plan all the details of the decorative scheme should be inserted. Thus, the china


South Side
Pantry Door
7'-0" High
2'-8"
5'-6"
7'-0
8'-0
Fire Place
2'-4" High
11'-6"
12'-6"
4"
14'-0"
Window
2'-6" above floor
7'-0" high
17'-0"
18'-6"
0
North Side
Center Line of door
9'-9"
Door 4'-0" x 7'-6"
18'-6"
East Side
3'-0"
Window
4'-0" above floor
7'-0" high
9'-0"
12'-0"
12'-0"
unbroken wall
West Side

(a)


Tile Hearth.
China Closet
Window Seat.
China Closet
·DINING ROOM·
Buffet
Built in Wall.

(b)

FIG. 31

closet on each side of the east window and the buffet built in the west end of the room are shown, together with the tile hearth in front of the fireplace.

The side walls of the room can be drawn to scale in the same way, preferably on water-color paper or bristol board, so that they can be rendered in color or in line when finished; or, the elevations can be sketched in pencil on detail paper, and when all the details and alterations have been decided on, they can be redrawn on finer paper for rendering.

It affords excellent practice for the beginner to measure up the rooms of his own house, and, after drawing them to scale, to render them in color for some decorative scheme. In fact, several schemes should be tried. The wall space with its door and window openings should be drawn out to scale on brown detail paper and then with a sheet of white tracery paper laid over, a decorative scheme can be worked out. The trim of the door can be altered to introduce a pilaster and entablature effect, and the panels can be rearranged accordingly. The same may be done with the windows, and a leaded- or stained-glass treatment introduced in the sashes. The walls may be paneled or wainscoted with a dado and additional pilaster treatment like the doors, and the frieze and field may be enriched harmoniously with the style or period. Again, a plain batten treatment may be carried out on the walls, and the door and window trim made to harmonize with it in simplicity. Portières may be introduced instead of doors, and suggestions of tapestry, leather, stencil, or other treatment introduced into the panels. Various color schemes on the same general structural design should be practiced, as much will depend upon the color effect of the completed representation. In doing this the student should carry a mental idea of everything he is to introduce —what kind of wood he is to use, what way he will treat it, what fabrics are intended in his representations, etc., so that he could be prepared at once to carry out the idea just as he had planned.

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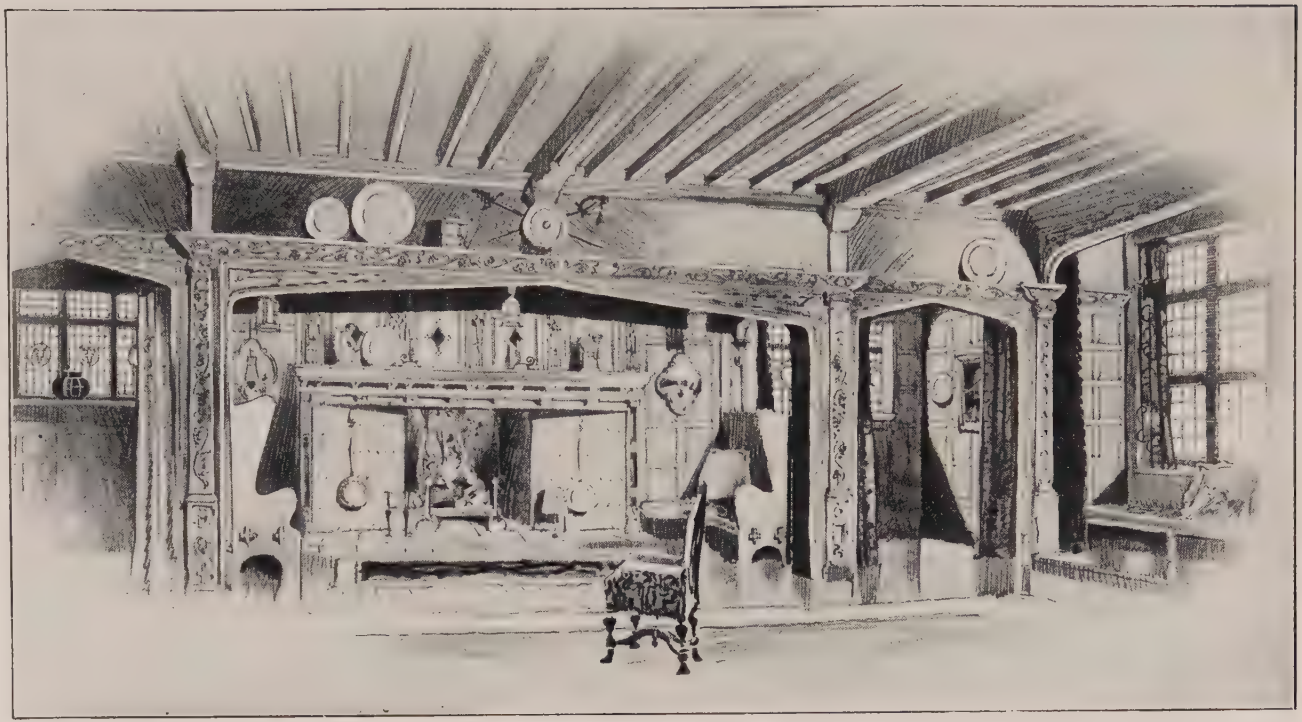

FIG. 32

RENDERING THE DRAWING

53. With the decorative scheme all laid out in pencil, the drawing is ready to be rendered. This may be done in *pencil*, in *pen and ink*, or in *color*. Pencil work is usually chosen for rough, sketchy renderings, as in Fig. 32, where the details have not been entirely worked out, although, in

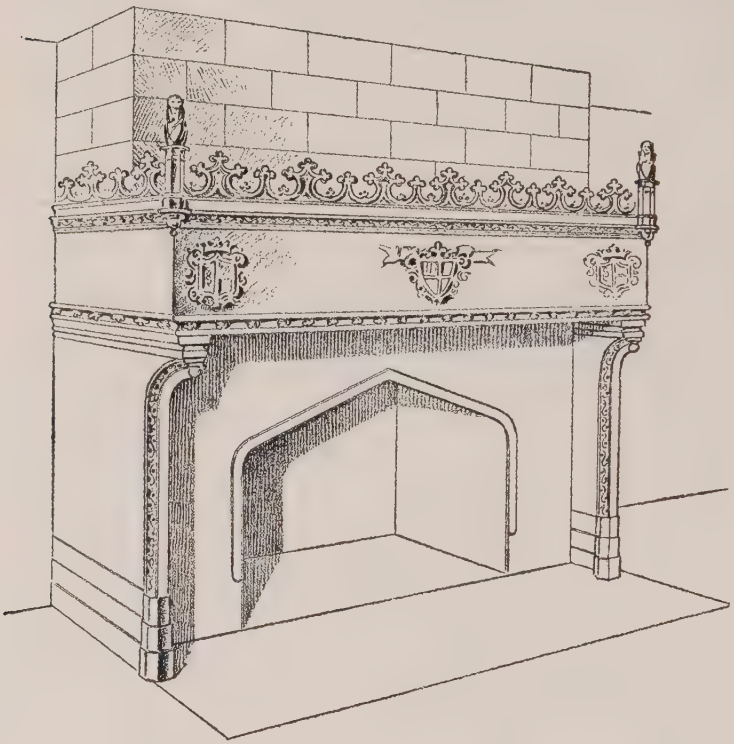

FIG. 33

some cases, a piece of furniture or a mantle can be rendered very satisfactorily in pencil and at the same time be made to show very clearly the details of the carved ornament and moldings. In Fig. 33 is shown a design for a stone mantle that was rendered entirely in pencil. Here, all the details are sharply outlined, and they show up to their full value.

(*a*)

(*b*)

FIG. 34

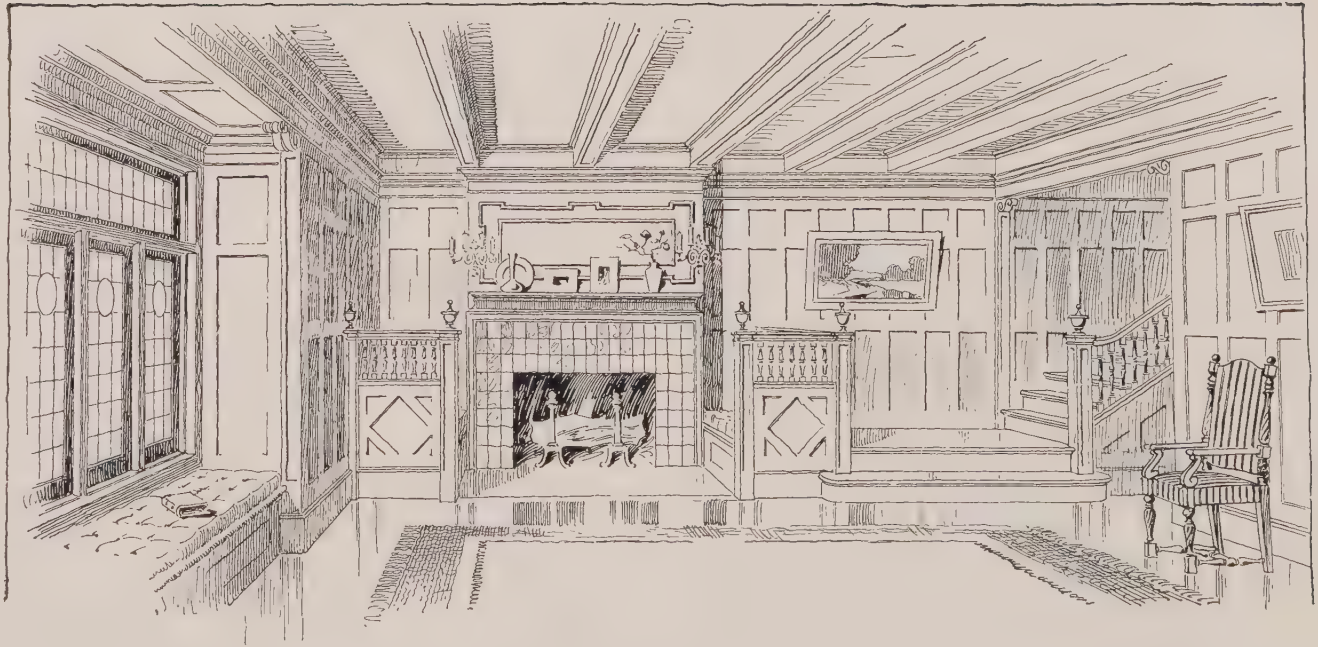

Fig. 35

This design was laid out in perspective with instruments, and then the details were drawn in with pencil. There being no color scheme to exhibit, the pencil design is perfectly satisfactory.

54. Where there is to be a decorated spandrel or a frieze panel, as in Fig. 34 (*a*), the sketch of it may be laid out in pencil on the preliminary drawings, with the shaded sections worked up as in (*b*), but it is not necessary to carry out the entire color scheme as it is to appear when finished. In fact, the designer rarely has the designs for the decorative paintings selected when the preliminary sketches are completed, and a sketch that is as detailed as the one shown in Fig. 34 (*b*) is not necessary. All that is usually required is that the general governing lines of a decorative scheme be laid out so as to indicate the idea; after this, the scheme itself can be worked up to suit the conditions.

55. Pen-and-ink work is used mostly where the designs are to be reproduced for illustrations. In Fig. 68, the examples of Louis XV and Empire furniture are rendered in pen and ink, the characteristic ornament being clearly shown in outline, although the color value is lost by this method of rendering. Stronger effect could be obtained by the use of color, but this is hardly necessary in furniture design, as the upholstery goods can usually be shown separately, and of course a better idea can be obtained from the material itself than from any sketch of it in color.

Pen-and-ink outline interiors, as shown in Fig. 35, can also be made attractive either as submission sketches or as illustrations.

56. Water color affords the simplest means of giving a pictorial idea of a decorative scheme, and it is the medium most frequently used. The renderings are made in plan elevation or in perspective, as the case may require, but for general sketches the plan of a ceiling or the elevation of a side wall can be made to suit all the requirements, and perspective drawings need be resorted to only when demanded by elaborate and expensive schemes. The examples that

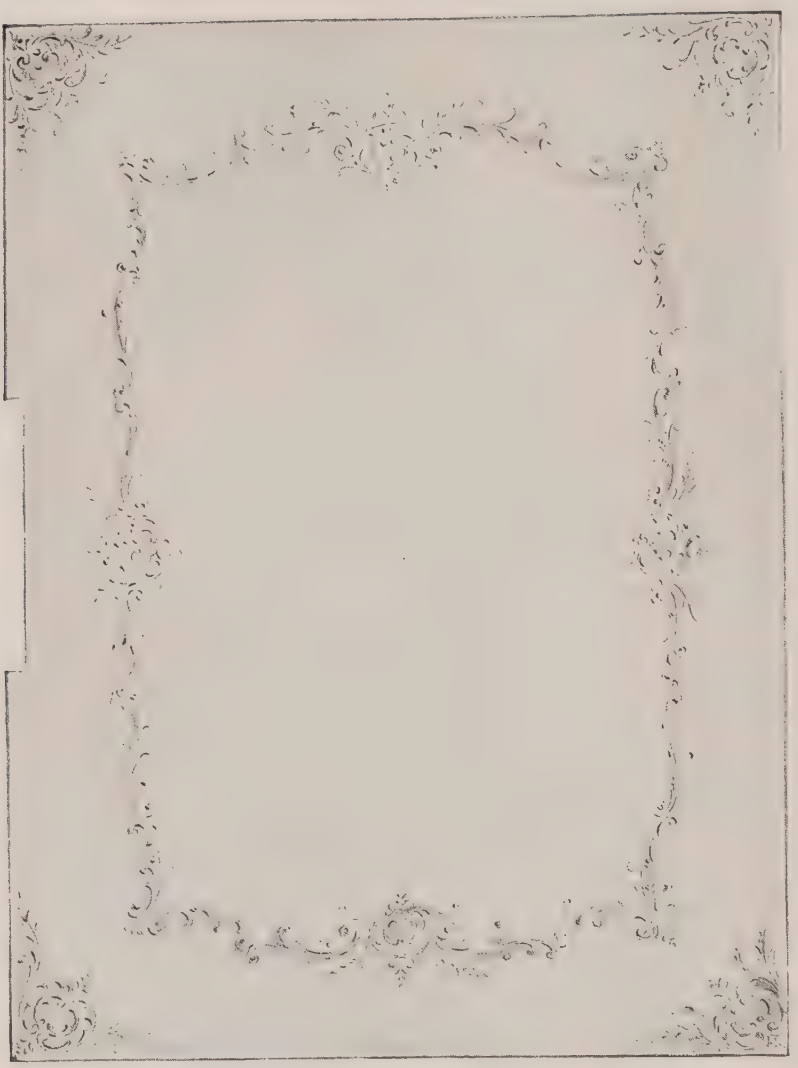

FIG. 36

follow show the rendering of schemes of design and color effect for interior decoration.

57. In Fig. 36 is shown a plan for a simple Louis XV ceiling. In order to design a ceiling similar to this, it will first be necessary to measure the size of the room, and then draw the plan of the ceiling in pencil to a scale of $\frac{3}{4}$ inch to the foot on ordinary detail paper. The governing lines of the central rectangle should then be sketched in and altered and redrawn until the form is satisfactory. After this, the branching scrolls should be drawn in, and finally the corner ornaments. This completes only the rough sketch, but when this is satisfactory, a piece of tracing paper can be laid over it and either one-half or one-quarter of the design carefully traced off, to be transferred finally to drawing paper or to bristol board. The outline of the plan of the ceiling should then be carefully drawn in pencil on the bristol board or the white drawing paper, and the tracing reversed and laid over it, pencil side down. With another pencil (about H B grade), the outline of the design should be carefully gone over, so as to transfer the pencil design from the tracing to the final paper or the bristol board. This should then be repeated either two or four times, according to whether one-half or one-quarter of the design is traced off, until one-half or all of the design is completed. The finished drawing should then be worked up by judicious touchings with a soft pencil here and there, and, finally, the color should be laid.

A flat, even wash should be carried from the upper left corner to the lower right corner, and when this is dry, a darker wash should be touched in under the ornament so as to give it relief. A few strong touches of soft pencil and a few highlights put in with Chinese white will complete the design. When carried out in this manner, the work is extremely simple, while the result is sharp and pleasing. No colors are used, yet the full effect is attained in monochrome.

58. In Fig. 37 is shown the rendering of a design for an Oriental ceiling, but owing to the complications of the design only one-quarter of it is drawn. In order to render a

design like this, the outline should be laid out in pencil, as in the preceding design, and the main structural lines then sketched in on the preliminary drawing. The lines of the molding forming the border should be drawn in with the T square and triangle, and the elliptical centerpiece contoured mechanically after its length and breadth have been determined. The circumference of the ellipse having been divided into an even number of parts, the ornamental section of each part should be roughly sketched in a number of places until a desirable form is obtained. After this, the main structural lines should be traced and then transferred, as in the previous case, but the details of the ornament should be worked up separately and then each traced and transferred by itself.

In a preliminary sketch of this character, it is not desirable that every detail of the decoration show up distinctly, but rather that the general effect be depicted and the color scheme as a whole be brought out. The latter can be accomplished by laying a flat wash of burnt sienna over the whole design and then overlaying the stronger colors on the dry wash. After sketching in the outlines of the ornament with light touches of a brush charged with a deeper tone of burnt sienna, the jeweled effect can be obtained by distributing the minute spots of red and blue so as to produce the desired general effect.

59. The treatment shown in Fig. 38 was for the dining room of a house built at Saratoga, New York, the same room that is shown in Fig. 31. The woodwork was 4 feet 5 inches high, and of clear, white pine enamel-finished in cream white. Above this woodwork the wall was decorated with a modern imitation of French tapestry. The drawing was carefully laid out in pencil and the woodwork lightly washed over with the weakest possible tint of gamboge, to which a little burnt sienna was added occasionally to vary the monotony of the flat tint. The cast shadows and shaded portions were then indicated with a pale wash of Prussian blue and crimson. The tapestry effect was first sketched in

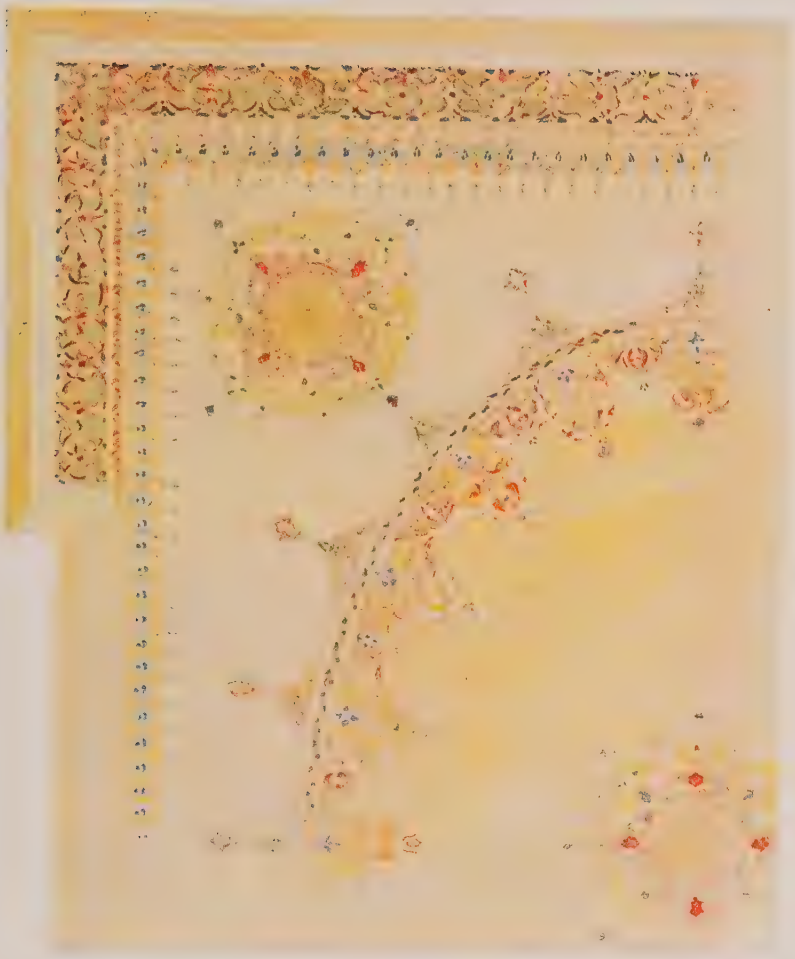

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Fig. 37

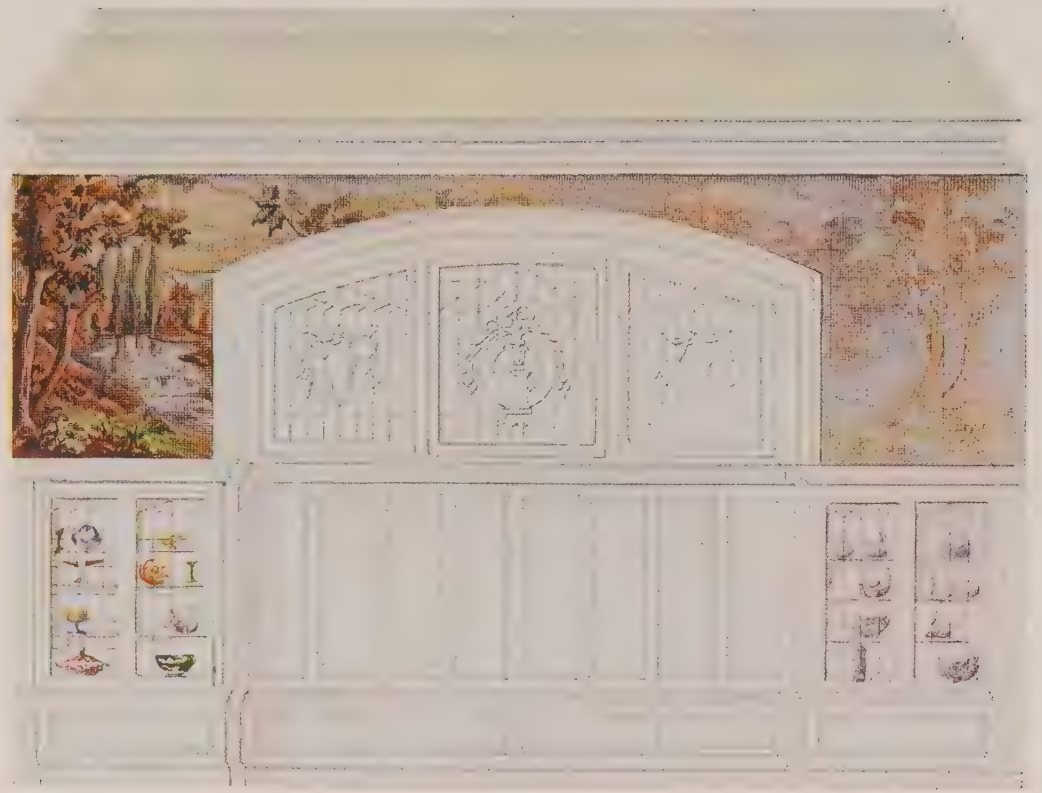

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Fig. 38

pencil, and then all was lightly washed in with yellows and browns, as shown at the right. Then, at the left, the design was worked up stronger with local color so as to show the detail. The lead work in the windows was penciled, with only a touch here and there of light blue to give the feeling of transparency. The effect of the cut glass in the cabinet at the right was produced with crimson, but the utensils in the cabinet at the left needed higher coloring, owing to the stronger effect in the tapestry above them.

This is a characteristic sketch for a scheme of decoration, and shows precisely how much of a drawing should be finished up and how much of it should be left in a sketchy, unfinished condition. The original design was drawn to a scale $1\frac{1}{2}$ inches to the foot and it measured 14 in. $\times$ 18 in.

60. The treatment shown in Fig. 30 was for the sitting room and library of a house at Newport, Rhode Island. The bookcases are 3 ft. 3 in. in height, and the wainscot extends 9 inches above them. In the sketch, they are tinted with a very pale wash of burnt sienna and charcoal gray, while the shadows are cast with a deeper wash of the same colors. The highlights are indicated with Chinese white, used mostly in a ruling pen. The egg-and-dart treatment in the cornice was effected by tinting the entire cornice to match the woodwork, and then contrasting the highlights and shadows on each egg-and-dart detail with Chinese white and deeper wash. Pencil lines do not play an important part in this sketch. The drawing was made to a scale of $1\frac{1}{2}$ inches to the foot, and measured 12 in. $\times$ 18 in.

The upper wall was of green ooze leather, which was stamped in gold at the top and stenciled at the bottom. The door was of mahogany, with gold-plate fittings. To secure an effective treatment in this sketch, the coloring of the books and the bric-à-brac had to be varied and interesting. The monotony of an unbroken stretch of white woodwork half way up the wall would have created a bad impression on the person considering the design. As it is, however, this monotony is destroyed by the well-chosen variety of

tones in the books that balance so well the rich mahogany of the door.

61. Fig. 39 shows a broad and simple treatment of white woodwork setting off three doorways of leaded glass. The wood trimming and cornice in this design were sketched in broadly, but carefully, with pencil, and the cast shadows were indicated with a pale neutral tint and crimson. Three designs for the leaded-glass treatment were carefully worked out in pencil and then colored up somewhat highly to get contrasts. Greens and brownish yellows characterize the general tone of the whole design, while stronger greens, contrasted with oranges and reds, emphasize the details. This illustration shows how effective a drawing can be made no matter how simple its details may be. The scale of the original drawing was $\frac{3}{4}$ inch to the foot, and it measured 10 in. $\times$ 16 in.

62. Fig. 40 shows in a single sketch the side wall, fireplace, and ceiling treatment of a small dining room. The wainscot is paneled in dark oak, and the top of it extends out and is supported on heavy iron brackets to form the mantle shelf. The chimney breast is executed in Dutch tiles of various designs. The upper wall is treated in water color, with an armorial device over the mantle. The ceiling is beamed with tinted plaster in the panels. The woodwork is rendered in burnt umber, with the highlights in Chinese white, while the side wall is in cobalt blue and neutral tint and the ceiling in burnt sienna and yellow ocher.

This is a very inexpensive and simple treatment, and is suitable for a variety of purposes. The style is distinctly German and is suggestive of a Tyrolean café.

63. In the design shown in Fig. 41, the pilasters were washed in with Vandyke brown, to which a little umber was added so as to vary the monotony of tone, and the moldings were drawn with a ruling pen filled with a darker color. The wall was then washed over with Indian red and crimson, and the pattern in the upper part drawn in Chinese white and a tint darker than the background.

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FIG. 39

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FIG. 40

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FIG. 41

HISTORIC STYLES AND PERIODS

64. The decorator and designer should be familiar with every style of architectural design and also with every period. **Historic style** pertains to the architecture of a nation, or country, during the entire time that that nation existed. Thus, the Egyptian style, the Greek style, etc., mean the characteristic styles of these countries, while the Gothic and Renaissance styles pertain to the architecture of all Europe, in contrast to the architecture of Western Asia and Northern Africa, which was practiced at the same time. Gothic architecture was inspired by a uniform religious movement that affected all civilized Europe, while Moslem architecture was inspired by another religious movement that at the same time was affecting Western Asia and Northern Africa.

Period decoration consists of the characteristics of particular periods of a style; as, the Louis XVI period of the French style, the Elizabethan period of the English style, etc.

65. Buildings are usually built in a certain style of architecture, while the rooms are decorated in several different periods of that style. Architectural styles can be learned only by close study of the various influences that have characterized each country, and to comprehend the different periods of each style properly, knowledge must be had of the social, political, and religious conditions that caused each particular period to exist. Therefore, in making modern designs in accord with some historic period, the conditions of each case will determine very largely what period is best suited. The discussion of a few applications of historic styles and periods will assist in the gaining of a knowledge of the harmony that must exist in the style of decoration and purpose of a room.

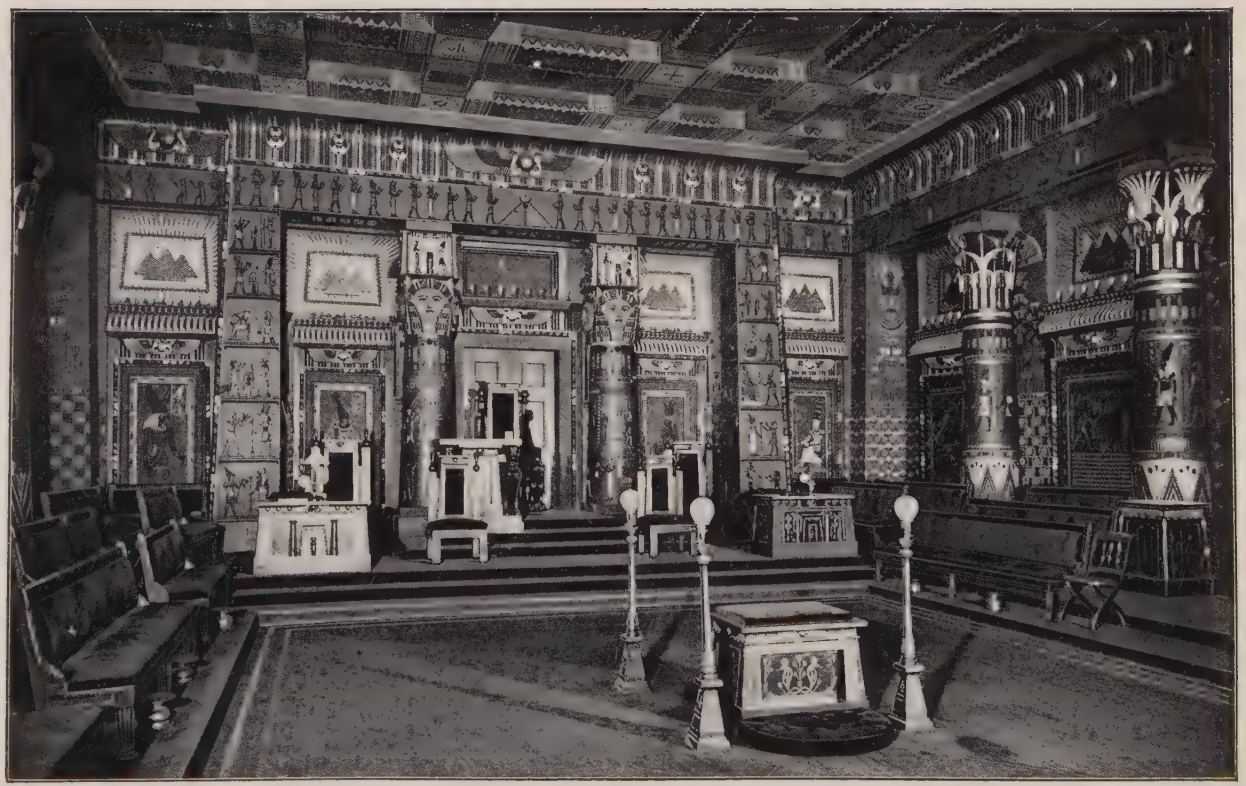

FIG. 42

EGYPTIAN STYLE

66. The vast difference between the conditions of the civilization of the ancient Egyptians and that of modern Europe and America renders Egyptian architecture and

FIG. 43

decoration of little use in modern buildings, but occasionally, with a few alterations, it finds an appropriate place, as in one of the lodge rooms of the Masonic Temple, at Philadelphia, as shown in Fig. 42.

FIG. 44

The effect of this style of design is solemn and impressive and thoroughly in keeping with the mysterious rites of an ancient secret society. Note the emblems that have been worked into the decorative details of the wall panels, altar fronts, chair backs, etc. All is in perfect harmony with the Egyptian style and at the same time in keeping with the purpose of the room. There is scarcely an element of Egyptian ornament that does not find a place in this decorative scheme, and when seen in the full glory of its color effect, it is magnificent and imposing.

67. In Fig. 43 is shown the elevation of the entrance to the Egyptian Room in the Crystal Palace, England. This palace is a museum, and the British government has erected therein rooms in different styles of architecture for the benefit of art students and historians. The example here shown is worked out as purely Egyptian as possible from historic writings.

GREEK STYLE

68. The Greek civilization presented many details more in harmony with modern ideas, and although the Greek buildings were small and not suitable for modern purposes, the style of decoration is to be found in an adapted form in many modern buildings. The characteristic Greek building was Doric architecture, but the Greek Doric column is so short and thick that it does not lend itself readily to modern ideas. However, the characteristic types of ornament enter readily into modern surface-decorative schemes.

ROMAN STYLE

69. Roman civilization was the foundation of many of the modern customs, and although the Roman styles are not followed with exactitude, they are, with slight alteration, found in many of the later Renaissance designs. Fig. 44 shows the Ionic room in the Masonic Temple previously mentioned, and although the columns and capitals are

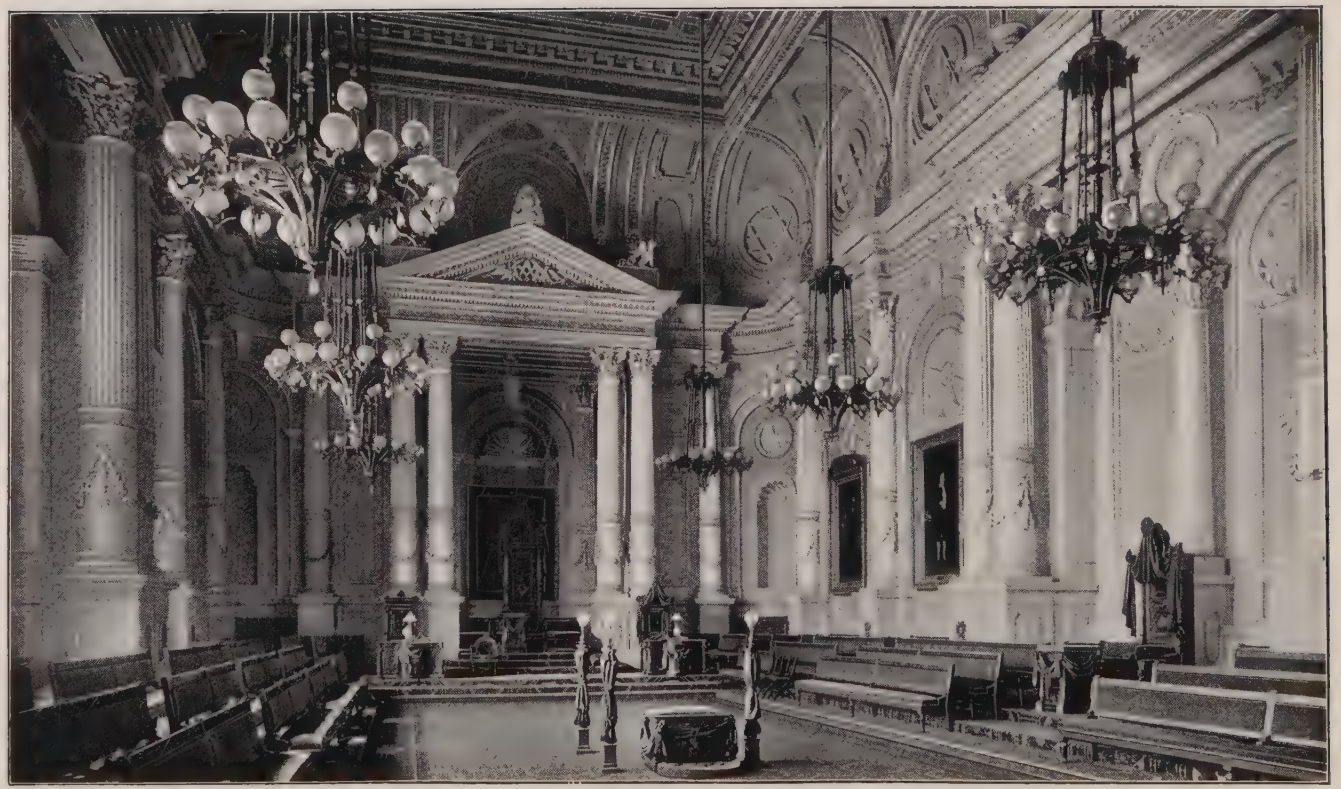

FIG. 45

FIG. 46

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modernized Roman, the decorative details are purely Greek, or as nearly so as modern conditions will admit. The introduction of the portraits in the wall panels detracts materially from the classic effect, and the details of the furniture are not so characteristic as were the examples in the Egyptian room; nevertheless, the effect is carefully studied, and the subdivision of the wall gives loftiness and dignity to the apartment.

CORINTHIAN STYLE

70. The Corinthian room of this same temple is shown in Fig. 45. This room is far richer in effect, owing to the greater possibilities of the Corinthian ornament. The pediment over the chair at the end of the room adds dignity and impressiveness to this part of the composition, and is a feature that was lacking in the previous design. The wheel-and-star forms in the vault spandrels and the shell tops in the niches, are more Gothic and Renaissance than Roman, but the whole is an excellent adaptation to the purpose.

GOTHIC STYLE

71. With the Gothic period, an entirely new scheme of interior effect was produced, owing to the importance that residence architecture assumed in connection with the feudal system of government, religious zeal, and chivalry. Woodwork assumed an important position in building and a combination of carved stone, painted walls, and wood paneling characterized the interiors.

In Fig. 46 is shown a sleeping apartment in the Château Pierrefonds, the walls of which are of decorated plaster with characteristic wood paneling and decorated ceiling beams. The mantle is of carved stonework decorated above with conventional scenes from the hunt.

72. In Italy, where stone was more abundant, woodwork was not so much used. In the interior shown in

FIG. 47

(*a*)

(*b*)

FIG. 48

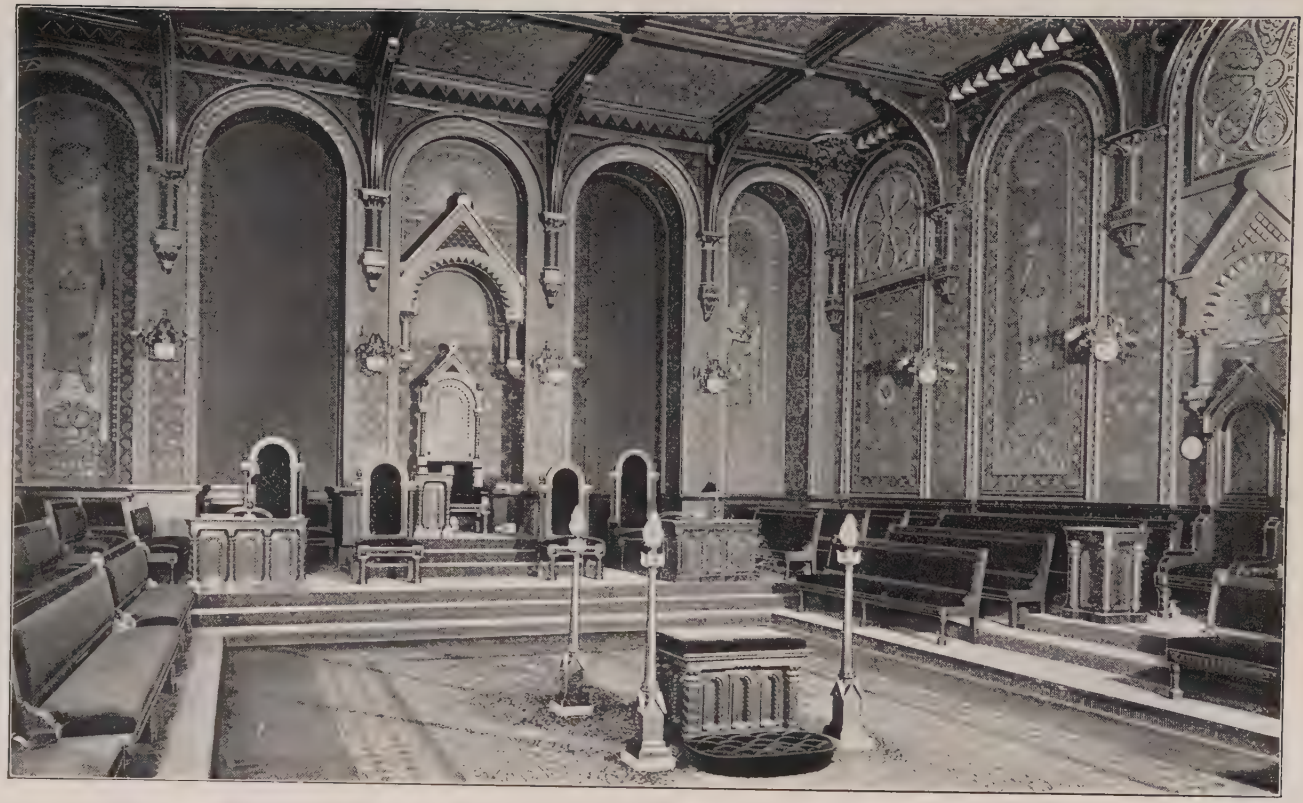


FIG. 49

FIG. 50

Fig. 47, a diaper treatment is worked out on the side walls and vault soffits, with a frieze of shield forms decorated with coats of arms, crests, and other heraldic devices. The mantle is simpler and more classic in molding, as is also the door trim. The furniture, however, does not belong to this period, but to the late Renaissance.

A similar, but more symmetrical treatment, is seen in the modern decoration of the crypt of the church of St. Chapelle, in Paris, Fig. 48 (*a*). A simple diaper pattern ornaments the soffits of the vaults with a border, while the columns are stenciled with small heraldic forms.

73. In the great hall of Warwick Castle, in England, Fig. 48 (*b*), the walls were left in their original stonework, but were relieved with antlers, pieces of armor, etc., while cases along the walls contain the armor, shields, lances, etc. of the old feudal owners of the estate. This illustration shows the apartment as it appears today, so that the rugs, furniture, and other accessories belong to a later period.

74. The bare walls of Gothic interiors were frequently hung with tapestries during the later periods, and these also form an important decoration during the early Renaissance. A simple adaptation of the Norman period of English architecture is shown in Fig. 49, which is another of the lodge rooms of the Masonic Temple, in Philadelphia. Every detail of furniture, floor covering, and ceiling decoration is in absolute harmony with the style. Such modern improvements as electric lights and fixtures are difficult to combine with the crude old architecture of the 12th century, but it has been effected here by casing the three altar lights with specially designed globes, in the form of torch flames, and mounting them on standards of characteristic design. The decorative historic figures in the wall panels practically prevent the introduction of modern paintings in the lodge room, and thus tend to preserve the character of the room.

75. The Gothic hall shown in Fig. 50 is not so successful as the preceding example, as the broad, unbroken wall spaces invite pictures or other details to break the monotony,

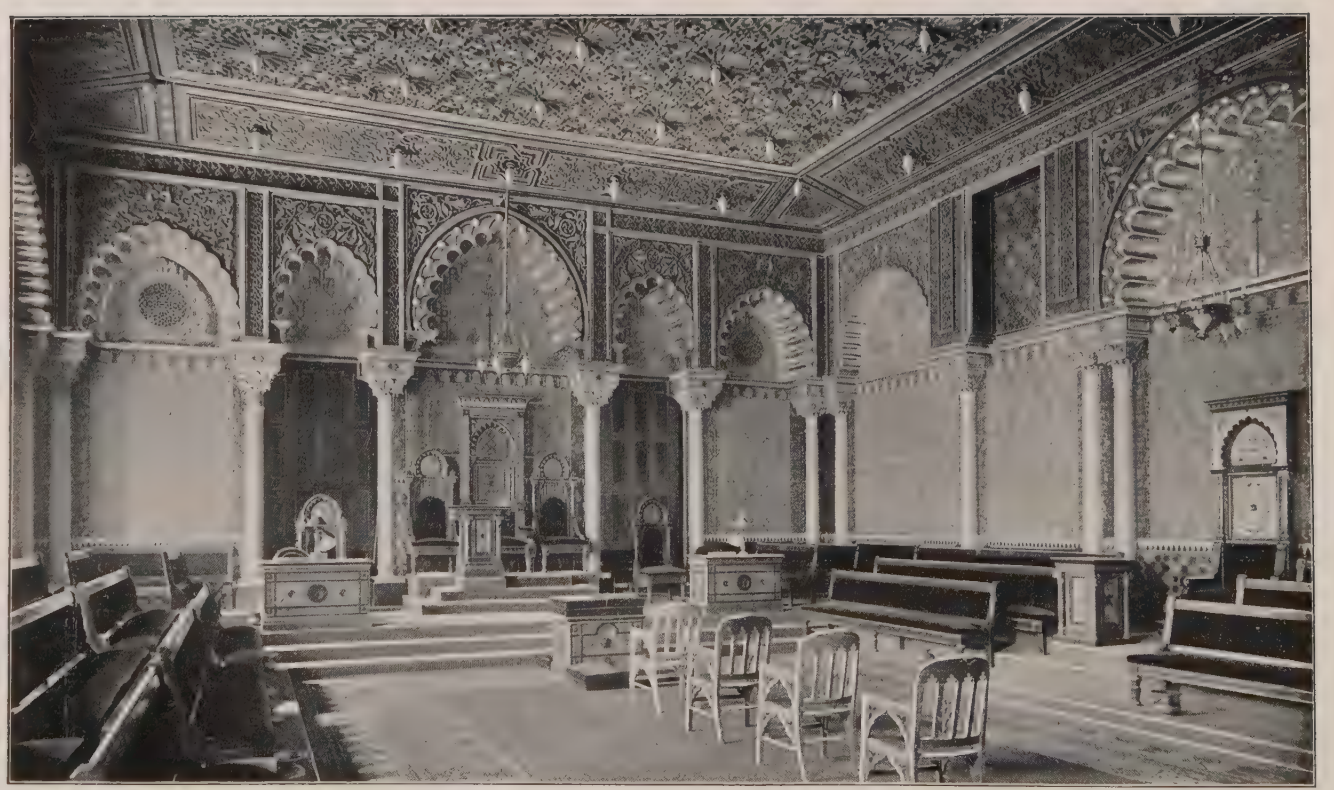


FIG. 51

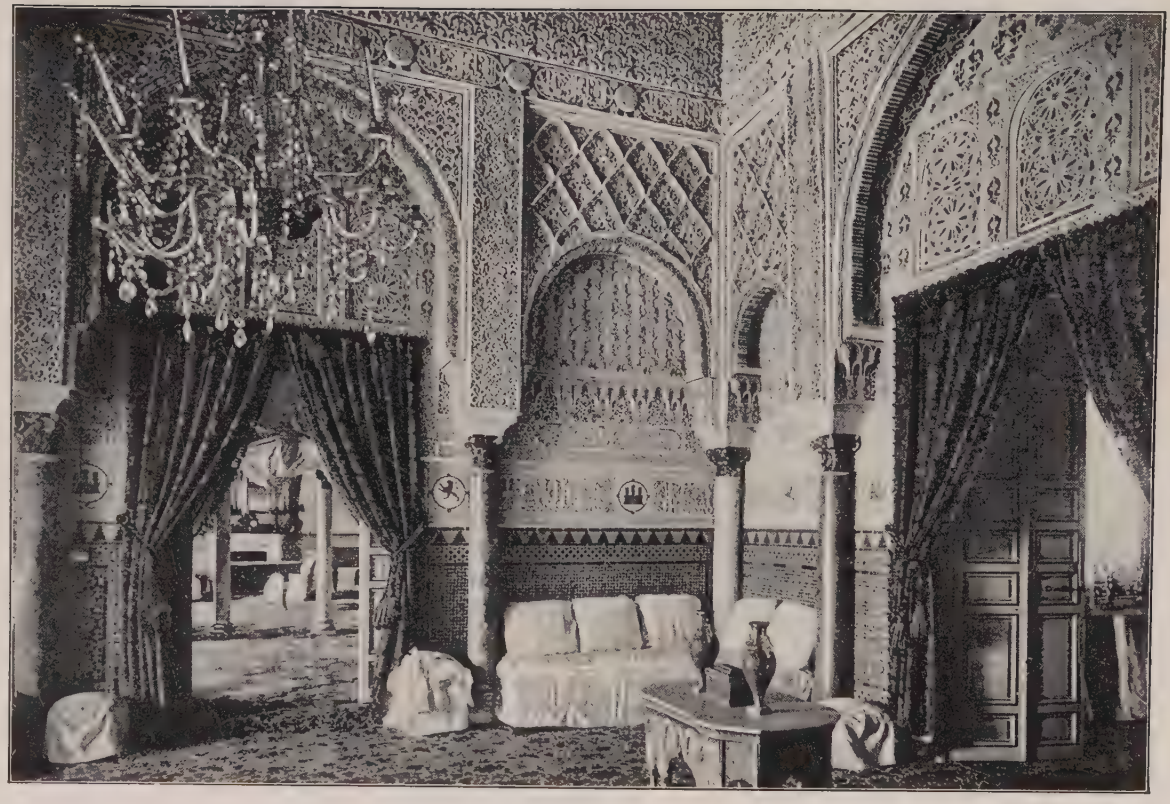


FIG. 52

and the harmony of the surroundings is at once destroyed by the ugly gilt frames of florid ornament extending far up into the soffit of the vault. The furniture here is well worked out in the late English style of tracery, but the doors and the moldings lack character and interest. How much more effective this room would be if it were paneled and decorated the same as the room in the old Château Pierrefonds, Fig. 46. There would then be no chance to deface the panels with modern portraits, and the spirit of the medieval craftsman would pervade the design.

MOORISH STYLE

76. Happier in this respect is the Moorish interior shown in Fig. 51. The beautiful diaper in its rich coloring (see *History of Architecture and Ornament*, Part 3) fills the entire room space, while in the intricate geometrical ceiling, the electric-lighted pendants harmonize perfectly with the design. Compare this interior with the apartment in the Alcazar, at Seville, Fig. 52, which was originally built over five centuries ago, and observe how completely the scheme has been adopted and how well it suits the conditions imposed. The fittings of the Moorish palace are somewhat more luxurious than those of the lodge room, but this would naturally be the case, as one is the abode of an ancient monarch, and the other the gildhall of a modern society of craftsmen.

RENAISSANCE STYLE

77. With Renaissance architecture is reached a stage that is distinctly period decoration. Gothic Architecture was divided into three periods in all countries (see *History of Architecture and Ornament*, Part 3), but these periods were periods of development of construction regardless of social or political influences, while the periods of the Renaissance reflect the characteristics of individual reigns and are under social and political influences almost entirely.

FIG. 53

ITALIAN RENAISSANCE

78. In Italy, there were three schools, or systems of design in the Renaissance, due to the dominant influence of certain architects in certain cities (see *History of Architecture and Ornament*, Part 4). The decorative motifs, however, did not present so wide a difference. The structural forms were essentially classic, owing to the proximity of ancient Rome, and the wall spaces, vaults, soffits, spandrels, and pier fronts were entrusted to the painter on which to lavish his skill. It is therefore not to be wondered at, that, with her great wealth and with such artists as Michelangelo, Raffael, and their contemporaries and successors, the mural decorations of the Italian Renaissance were the finest in Europe.

79. Michelangelo's chief work was the decoration of the chapel in the Vatican. This work represents the "Story of Genesis," and covers the entire ceiling and side walls. It occupied 4 years of the artist's time.

Raffael painted many panels in the rooms of the Vatican, but executed no single work so extensive as the frescos in the papal chapel. These pictorial wall decorations became characteristic of the Italian style. In Fig. 53 is shown the Vatican Library, every inch of the walls of which is covered with elaborate mural paintings in historical portraits, religious scenes, and intricate arabesques. The amount of work represented here is stupendous, and the color effect is so rich as to be bewildering. The groin ribs of the intersecting vaults are not emphasized here as in Gothic work, but the soffits are subdivided into square and crucial panels to contain portraits and allegorical pictures, while the field space is elaborated with cupids, mythical animals, and arabesques (see *History of Architecture and Ornament*, Part 4).

80. Where the barrel vault was used over an apartment, a continuous decorative scheme was carried out, as in the Riccardi Palace, at Florence, Fig. 88. Here, flat pilasters divided the side walls into panels under an elaborate baroque frieze, and the panels themselves were decorated

with paintings or elaborate arabesque designs in relief. The ceiling was painted with an allegorical scene, so composed that the darker portion of the design should lie next to the frieze and generally lightened in tone toward the crown of the vault, thus giving an impression of lightness and height.

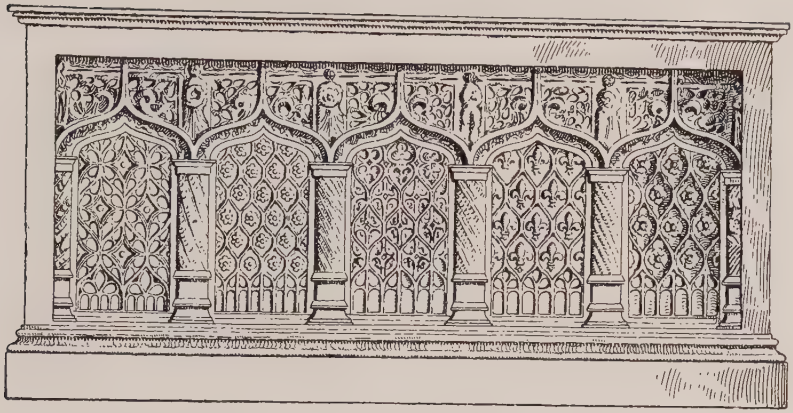
Italian Renaissance interiors were also designed in marble and rich stones, where painted wall decorations played little or no part, and these designs were carried out in a formal classic manner, precisely in accordance with the rules of Vignola.

81. During the Renaissance, the furniture design followed the style of the decoration, as did embroideries and tapestries. Elaborate carvings in wood characterized much of the panel work, and these carvings extended also to the movable furniture of the rooms. During the Gothic period, furniture was designed more for strength and utility than for comfort. Chairs consisted of hard, flat seats and perpendicular backs that reached far above the shoulders, and sometimes possessed a canopied top. The backs and arms were elaborately carved in traceried panels, but there was no upholstery and no inclination of the seat or back to add to comfort.

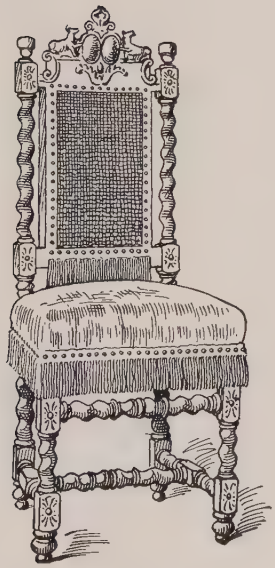
82. The beds were similar to the modern designs in form, but in the previous period were built in as a part of the house, somewhat like a horizontal shelf in the wall, over which curtains were hung. Later, the bed, though still a fixture, was placed in a corner or against a side wall, and posts were erected on each side at its end, to carry curtains that could be drawn around it and thus hide it from view. Finally, the four posts of the bed were carried up to form supports for the curtains that enclosed it on four sides and the bed became a piece of movable furniture. These posts, at first plain and severe, gradually became ornamental details that were either carved with tracery or treated in a manner similar to the small gabled buttresses that flanked the masonry walls.

With the Renaissance, the bedsteads became a part of the decorative scheme of an apartment. The four posts became

FIG. 54



(*a*)



(*b*)

(*c*)

FIG. 55

classic columns, the curtain rods were concealed behind an entablature, and a rich embroidered coverlet was spread over the linen. In Fig. 54 (*a*) is shown a typical Renaissance design of a 16th century bed, while in (*b*), (*c*), and (*d*) are shown some chairs of this period. None of these chairs is particularly comfortable to sit in, but every available space except the seat is richly carved in accordance with the ideas of the Renaissance style.

FRENCH RENAISSANCE

83. Renaissance architecture was introduced into France during the reign of Louis XII, when Gothic architecture was on the decline, but while Gothic forms were still strongly fixed in the art of the country. The grandeur of the classic style pleased the French patrons greatly, but the French designers, while adopting the Italian details, could not forget their Gothic traditions. Consequently, the classic forms were simply introduced decoratively, and all relation of these forms to structural conditions was ignored in fitting them to Gothic conditions. Wood paneling was retained on side walls, as in the Gothic period, but the pointed panel tops and carved diaper work, such as shown in Fig. 55 (*a*), gave way to simple rectangular panels of classic severity or were decorated with Italian arabesques.

Tapestries still covered the bare stonework above, for the great wall decorations of Raffael and Michelangelo at Rome were not yet finished. Carved chairbacks, wainscots, wall cupboards, etc. no longer presented crockets and quatrefoils, but showed symmetrical scrolls, wreaths, garlands, etc. In fact, the same characteristics of carved wall decorations existed inside as outside (see Fig. 39, *History of Architecture and Ornament*, Part 4). The walls were subdivided into panels and carved in arabesques and spindle forms similar to the stone panels outside. Stamped leather was used to fill some panels, or it was covered over the walls entirely, with decorated ceiling beams above. Columns and spindles became fluted and frequently took a long, attenuated vase

FIG. 56

form, or a combination of several vase forms one above another. See Fig. 56.

84. Flat pilasters were planted against the walls to divide it into panels, but instead of fluting the faces of these pilasters as in the classic orders, they were paneled and richly carved in arabesque. These arabesques were composed of scrolls and foliations, into which were introduced grotesque and mythical figures borrowed from the Italian style. Dancing cupids bearing wreaths enclosing medallion portraits were introduced into the friezes, which were widened beyond all proportions of the classic style. These same characteristics were carried out in the furniture.

85. Francis I Period.—In Fig. 56 is shown a bed of the Francis I period, the supports at the foot of which are carved in a series of superimposed vase forms surmounted by a fluted column. At the head, two Roman warriors support the cornice like caryatids, and the cornice, while pretending to be classic in character, is composed of few moldings, and its upper member is supported on Gothic corbels on an unusually wide frieze. It is evident that the ideas here expressed were derived from a design similar to that shown in Fig. 54 (*a*), but with no understanding that these classic forms were fixed and unchangeable by the rules of Vignola. The forms here are graceful and delicate and far more suited to their purpose than the heavy architectural details of the Italian design. The chairs used by Francis I were at first straight-backed, as in Fig. 55 (*b*), and upholstered on the seats. Later, the backs were inclined, so as to add to comfort and were also upholstered, as in (*c*).

86. Periods from Francis I to Henry IV.—From the Francis I period to that of Henry IV, the tendency to classicism increased. French artists studied under Italian masters, and the richness of display increased as the wealth of the nation grew.

The Italian Renaissance was copied as servilely by the French architects as the classic had been by the Italians. This was largely due to the fact that Catherine de Medici,

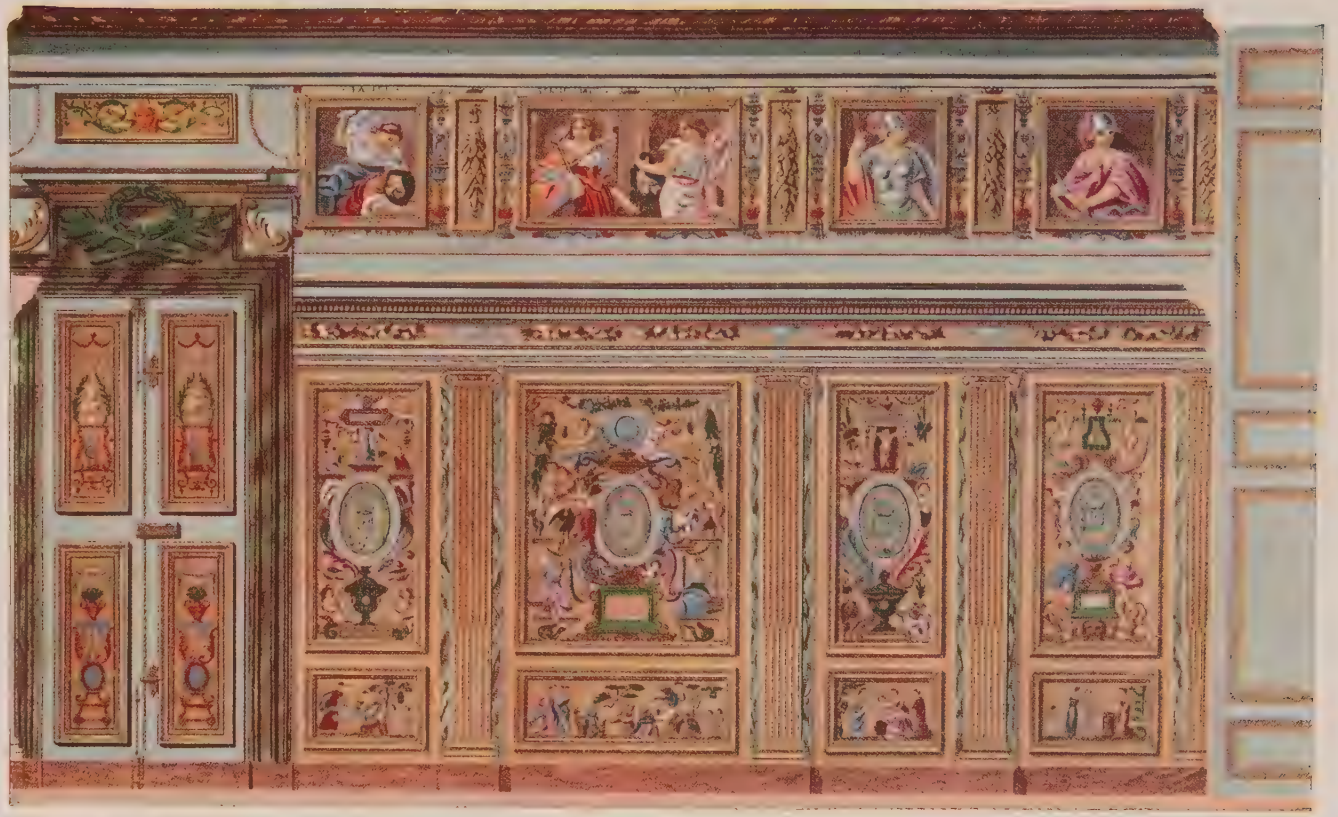


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FIG. 57

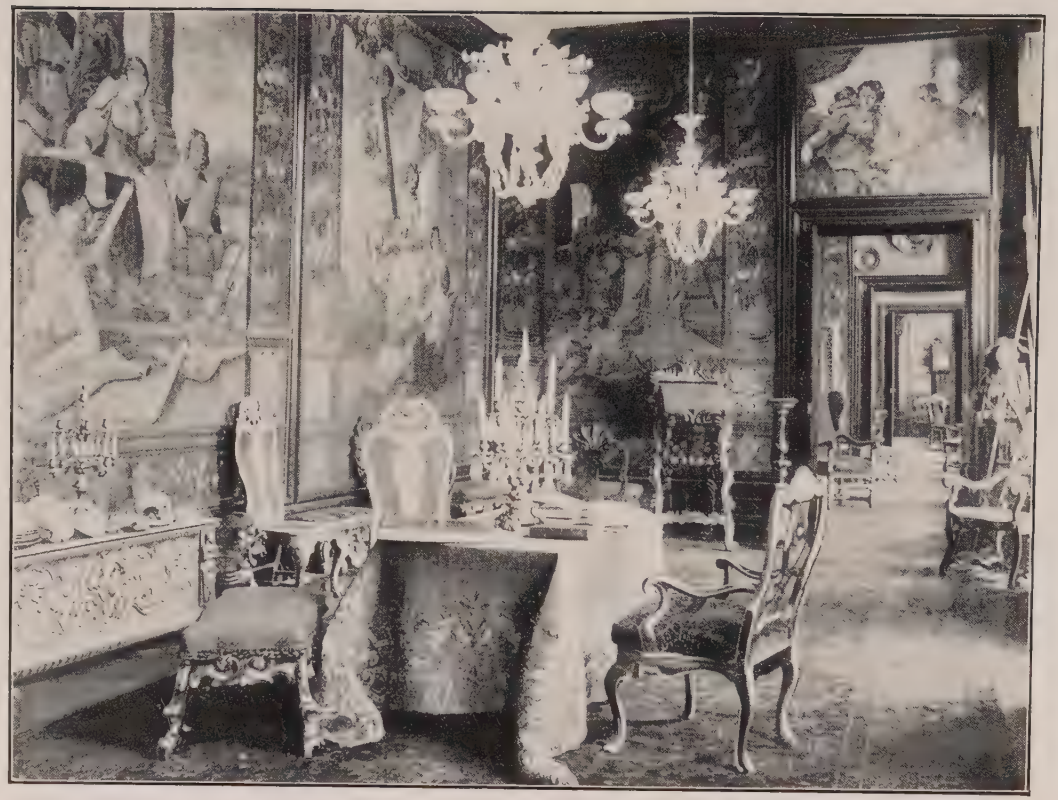


FIG. 58

Queen of Henry II (successor to Francis I), and mother of Francis II, Charles IX, and Henry III, was an Italian. Her influence dominated the court throughout this period, and the style continued into the reign of Henry IV.

The illustration in Fig. 57 will give an idea of the extent to which the richness of display was carried during the latter part of the reign of Henry IV and the early part of that of his successor, Louis XIII. Rich Italian marbles were imported for use as bases and door trims, and the wall panels were filled with the most elaborate paintings that the artists could devise. Columns and pilasters of enormous proportions were introduced to subdivide the walls, and heavy, projecting entablatures supported an elaborately paneled ceiling.

87. Louis XIV Period.—The period generally known as **Louis XIV** began in the reign of Louis XIII and extended into the reign of Louis XV. At this time, the great Gobelin tapestry works were founded by the French government, and many of the great palaces and royal residences were built. Architectural details were borrowed from the Roman Corinthian order and introduced independently as decorative details. The grotesque forms that had characterized the early Renaissance were abandoned, and the detail became more symmetrical and well balanced. Expensive woods were introduced for furniture, and the walls and the openings were hung with rich tapestries from the government works. Some of these are shown in one of the smaller rooms of the palace at Versailles, Fig. 58.

Shell forms were introduced in the acanthus ornament and also as a semidome form over niches and other recesses, but these were used sparingly and with dignity.

The Louis XIV period was characterized by an honest effort to produce a style of decoration distinctly based on the Italian Renaissance, but without the grotesque and meaningless detail.

88. Rococo Period.—The reign of Louis XV was one of great extravagance and luxury, and this was reflected in

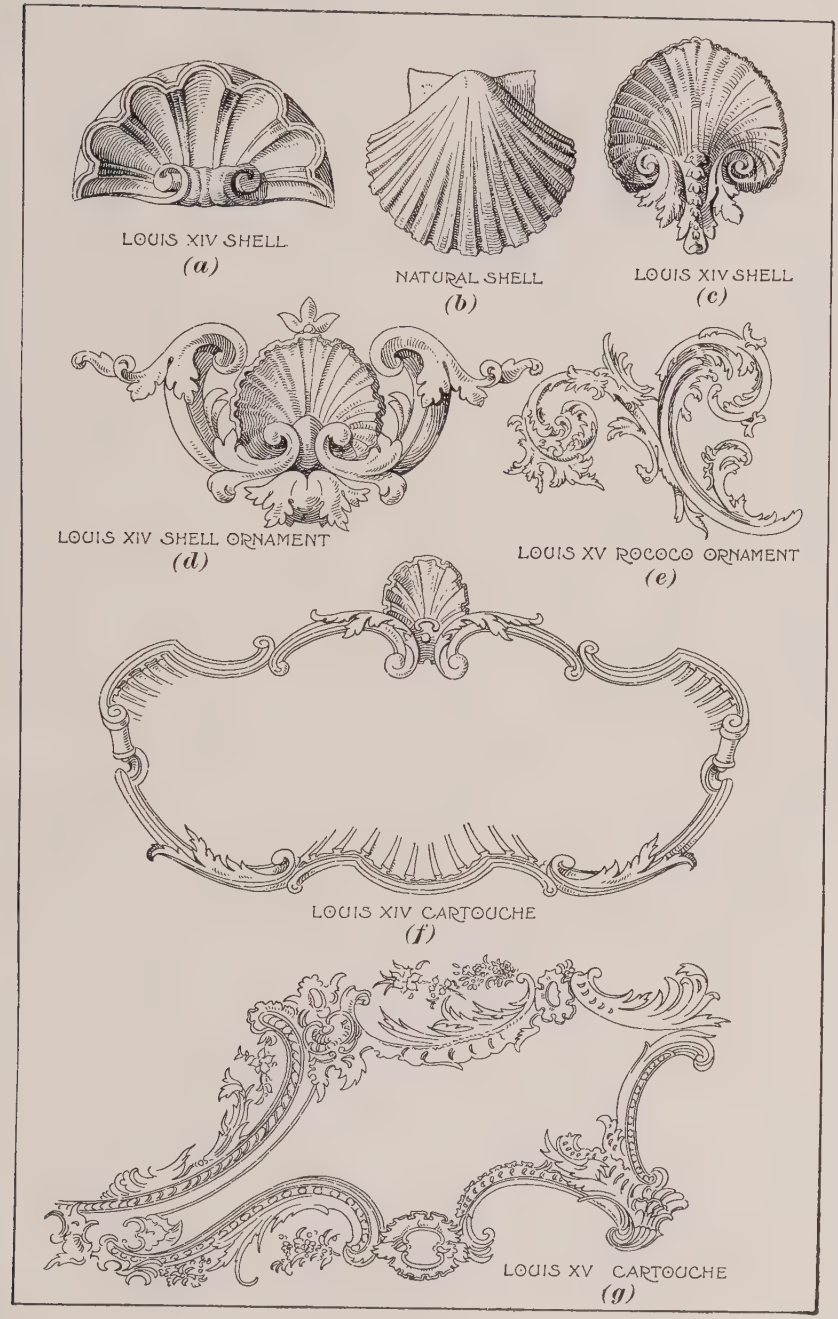

LOUIS XIV SHELL
(a)
NATURAL SHELL
(b)
LOUIS XIV SHELL
(c)
LOUIS XIV SHELL ORNAMENT
(d)
LOUIS XV ROCOCO ORNAMENT
(e)
LOUIS XIV CARTOUCHE
(f)
LOUIS XV CARTOUCHE
(g)

FIG. 59

the architecture. The well-balanced and symmetrical shell forms that were cautiously introduced in the previous style were twisted and curled into the most meaningless forms during this reign. Lack of symmetry was sought rather than avoided. Cartouches and panels, instead of being elliptical or rectangular, were outlined by a series of convex and concave curves and surrounded by a lot of flame-like scrolls and network that presented absolutely no symbolism or type. This period is usually known as the **Rococo period,** rococo being a term of French derivation meaning shellwork. In order to give this rococo ornament great prominence, it was richly gilded, and details of its scrolls stood out in great prominence, like nuggets of gold. The style was characterized by eccentricity and ostentation, without any attempt at harmony or good taste.

Various designers endeavored to outdo one another in eccentricity and originality. They appropriated the ornament of the Louis XIV period to their own uses, but twisted and contorted it until it lost its beauty and symmetry entirely. Where a design presented scrollwork on opposite sides, they would turn one scroll up and the other down, thus destroying the symmetry entirely, as in Fig. 59 (*g*), and finally the term rococo stood for all that was vulgar and ostentatious.

89. Shell forms, such as shown in Fig. 59 (*a*) and (*c*), were introduced in the designs of the Louis XIV period, sometimes as simple terminals, as in (*f*), and at other times with elaborate scrollwork, as in (*d*). The natural shell form, shown in (*b*), soon became merged into designs to such an extent that its identity was lost, and the scroll ornament of Louis XV became eccentric and meaningless. With Louis XIV, the ornament was executed with studied symmetry, as in (*f*), but with Louis XV, it was executed with equal eccentricity, as in (*e*) and (*g*).

90. During the Rococo period, the celebrated artists Watteau, Boucher, Tessier, Jacques, and others, who had designed tapestries during the Louis XIV period, executed frescos and wall paintings. These were varnished over in

Fig. 60

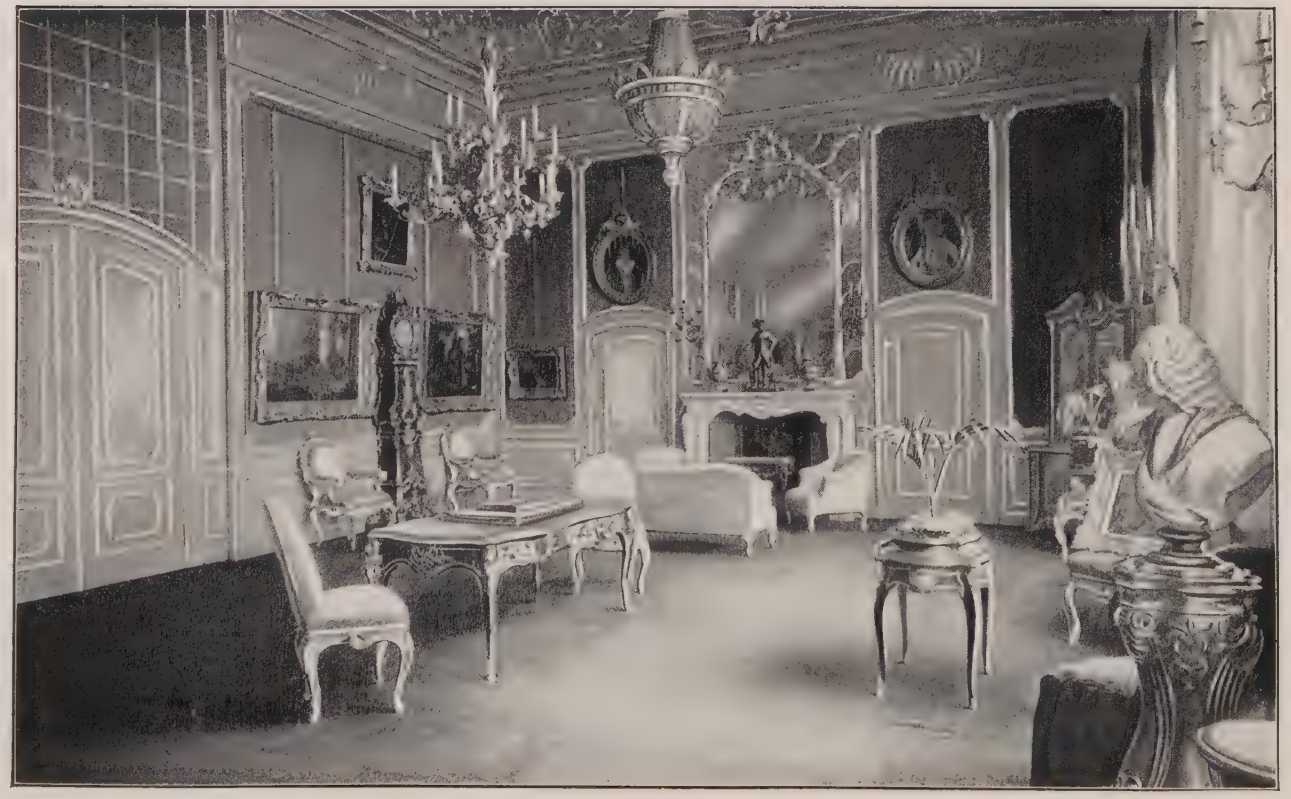


FIG. 61

some instances with a transparent enamel as hard as porcelain. Panels of woodwork in furniture were painted by Watteau. These presented dainty pastoral scenes, in which impossible shepherdesses in short satin skirts attended toy flocks, or, as shown in Fig. 60, richly gowned rural maidens reclined on the ground sipping wine with equally impossible peasants. These paintings were framed with conventional designs of foliage, lattice, and rococo work, and became characteristic of the period. Their merit lay not in the propriety of their application, but rather in the beauty and delicacy of their execution.

91. Louis XV was a wasteful and extravagant monarch, and all of the decorative work of this period reflects these characteristics. One of his favorites at court, Madam Pompadour, had more influence over him than any of his ministers, and through her individual extravagance, she introduced a style of upholstery work that bears her name. This wilful woman, becoming tired of the carvings on the furniture and the frescos on the walls, had them entirely covered with tufted fabrics of a yielding character, so that for a while it was a fad to cover the chair frames and wall decorations—all beautiful examples of the artists' skill—with tufted silk or other expensive materials. Madam Pompadour was succeeded in the king's favor by the Countess du Barry, who endeavored to outdo her predecessor in extravagance, and her tastes dominated the decorative art during the latter part of this reign. As the reign of Louis XV seemed to live only to indulge its extravagances, the Louis XV period is characterized by vulgar, ostentatious display, which is rich in gilding, elaborate in brass, bronze, and rich metalwork, and a blaze of color in painting and decoration—an elaborate and extravagant excess of all that Louis XIV had introduced.

92. In Fig. 61 is shown one of the smaller apartments in the palace at Versailles. The walls and ceiling of this room are divided into panels and decorated with the rococo ornament characteristic of the period, as is also the furniture,

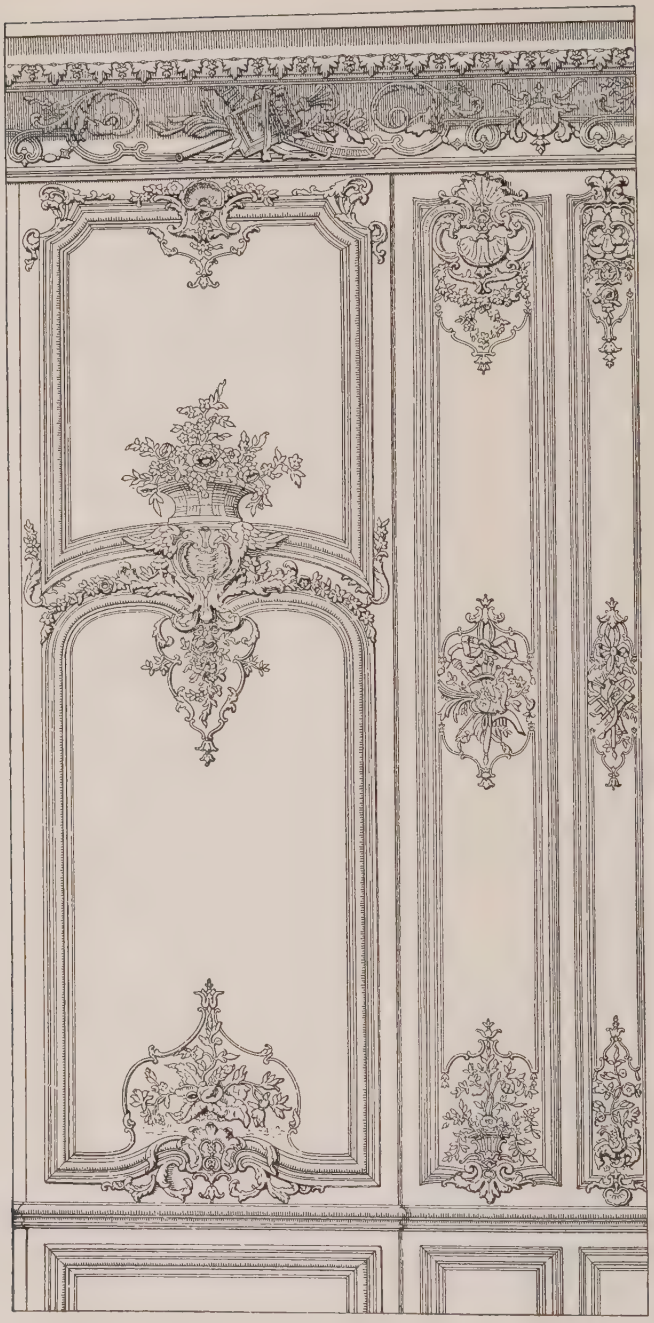


FIG. 62

I L T 100 § 49

FIG. 63

but here the ornament is not carried to the extremes that characterized the latter part of the reign. This room has been restored since the days of the extravagant king and his favorites, and much of the excess omitted. The mantel and mirror, and the chandelier frieze and angles of the ceiling still retain the meaningless scrolls, while the furniture, with its bandy legs and gold decorations, pronounce the period unmistakably. More characteristic are the wall panels shown in Fig. 62, which terminate in rococo forms, while floral and symbolic devices are introduced in raised designs.

93. Louis XVI Period.—Louis XVI was a weak monarch and lacked the courage to carry out the reforms that his queen, Marie Antoinette, considered necessary in view of the impoverished condition of the nation, which was brought about by the extravagances of the previous reigns. While the decorative themes of this period are known both as Louis XVI and Marie Antoinette, the honor for the reform in style is undoubtedly due to the latter. The period is characterized by a charming simplicity of detail, in contrast to the extravagance that had prevailed. The Louis XVI period was one of elimination of expensive luxuries. The elaborate paintings of Watteau and the extravagant tuftings of Pompadour were replaced by simpler panels of plain and inexpensive fabrics. The elaborate tortoise-shell inlaid furniture was replaced by simple designs in white and gold. The Marie Antoinette style rejected all the arabesque and rococo ornament, all the intricate hand-painted panels, and all the expensive metalwork and extravagant tuftings of rare fabrics. Fabrics were used extensively, but only in place of the more elaborate panel decorations that disappeared with the previous reign. Marie Antoinette decoration impresses one with its delicacy, simplicity, and good taste.

Where wall panels were painted, the designs were simple and much less expensive than in the previous reign, but most beautiful and delicate effects were obtained. Fig. 63 shows a painted door of this period. The walls of the room

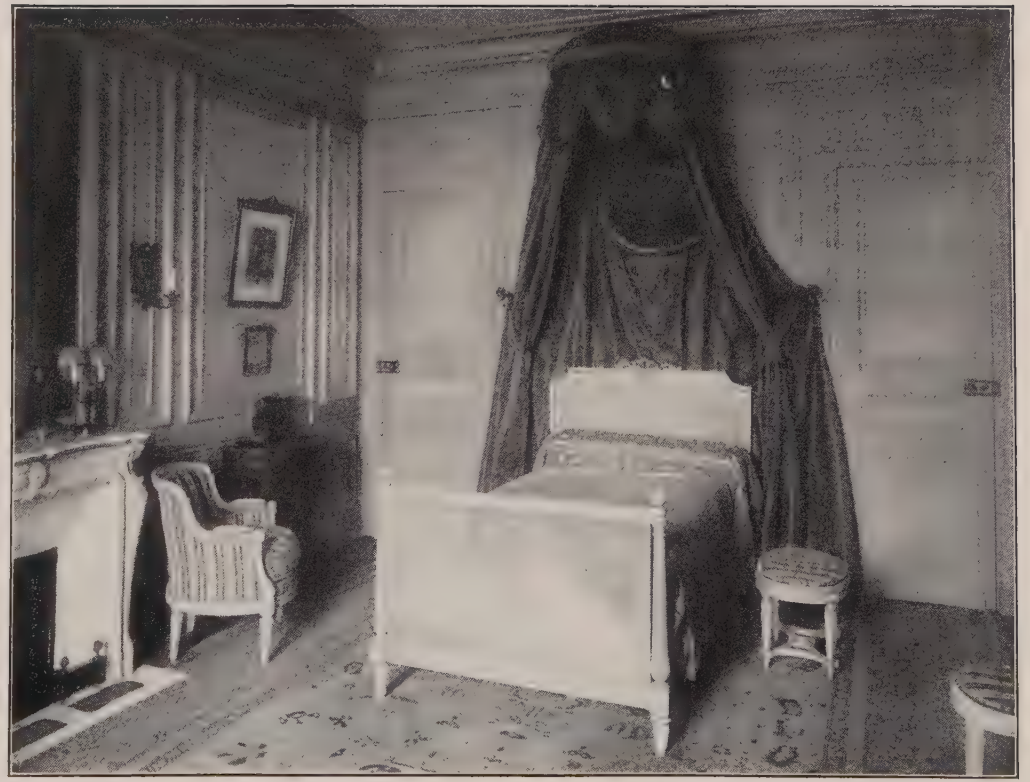


FIG. 64

FIG. 65

were divided into similar, but larger, panels and were ornamented with floral arabesques of various designs.

The Louis XVI period was a distinct reform, freed entirely of the burdens of elaboration that had characterized the French style for hundreds of years.

94. In Fig. 64 is shown a characteristic Louis XVI interior from the palace at Versailles. The plain paneled walls and the simple furniture contrast strongly with the elaborations shown in Fig. 61. The chairs are simply upholstered in a striped fabric with a figured background, and the footboard of the bed is simply enameled in white, with a slightly raised festoon across the top. Sometimes, the footboard also was covered with cloth to match the other furniture, and in this manner many dainty effects were obtained. The interior shown in Fig. 65 contains examples of Louis XVI furniture, but the walls are hung with tapestries and paintings by Watteau.

95. In visiting the Renaissance palaces of France, it is almost impossible to find any one apartment that is carried out strictly in accordance with any specific historic period. Most of these palaces are now converted into museums, and many details of one period are placed in a room with details of an adjacent period simply because they belonged to some person that lived at a period when the two styles overlapped. Then, also, the furniture that was made in the latter part of one period would continue to be used until it became worn or broken, even after a new style came into vogue. Thus, at the accession of Louis XVI and Marie Antoinette, there was only the rococo, scrolled, and gilded decoration of the previous reign, and no new designs were created until new furnishings were required for some of the apartments. The beautiful paintings of Watteau would not then be destroyed, but would be hung as works of art, which they were, and so form a part of the decorative details of the succeeding period. For this reason, many modern designs present the characteristics of a period more than many of the actual rooms in the historic buildings themselves.

96. The modern decorator, in preparing a design for a specific period decoration, can confine himself to details that are characteristic of that period, and he need not use any material that is better suited to anything else. On the other hand, thorough familiarity with the characteristics of each period and knowledge of what is historically permissible to use with it, will enable a decorator to satisfy the demands of exacting patrons without offending architectural good taste. For instance, rococo ornament, Watteau paintings and tapestries, expensive furniture inlaid with tortoise shell, gold, and silver, and walls and furniture upholstered in tufted fabrics, were characteristic details of the Louis XV period. None of these elements could be combined with the simple elements of the Louis XVI style, except the paintings, and these were retained only as works of art and accessories and not as elements of the decoration itself.

97. Empire Period. — After the extravagance of Louis XV and the weakness of Louis XVI came the French revolution, and from 1793 to the opening of the 19th century, art in France made no progress. After this period of bloodshed and terror, everything pertaining to royalty was exceedingly unpopular, and the designers endeavored to create a style that should contain nothing to recall the previous centuries of monarchy. Purely Roman forms could not be used on this account, so the efforts of the designers were directed from the Roman to the Greek, and from the Greek to the Pompeian. The Pompeian style as adopted by the French designers expressed a daintiness and delicacy that at once gave it popularity—a popularity not only in France, but also in England, thus introducing a new and characteristic decoration there.

98. Pompeian art forms were limited, however, owing to the lack of knowledge concerning the buried city; but with the few forms attainable and with Greek ornament familiarized by the publications of recent scholars, a style developed. The Greek style of dress at once became popular, and the palmette, honeysuckle, and fret ornament

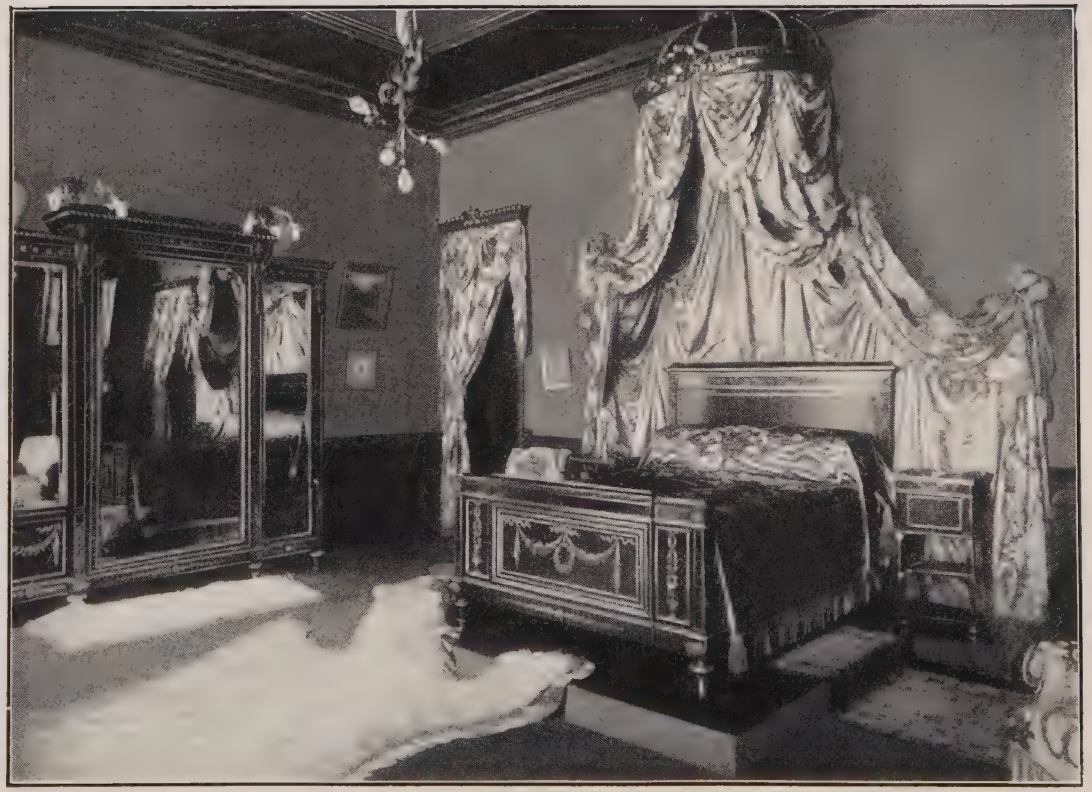
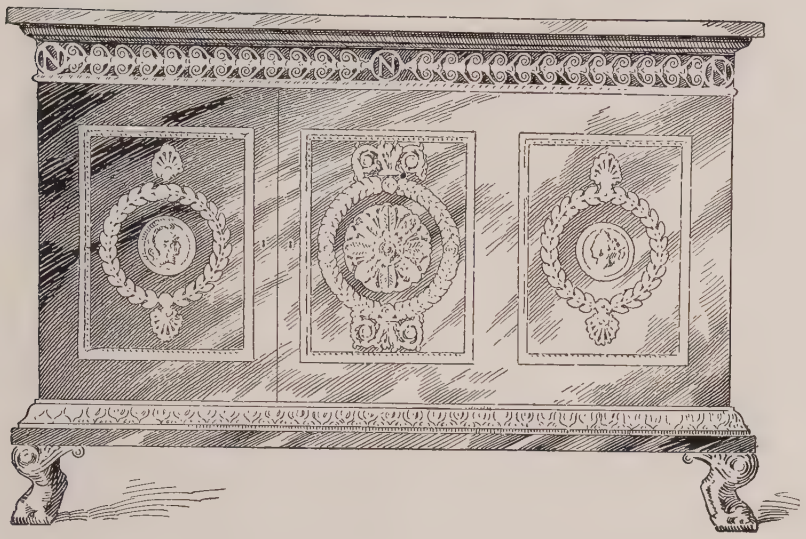
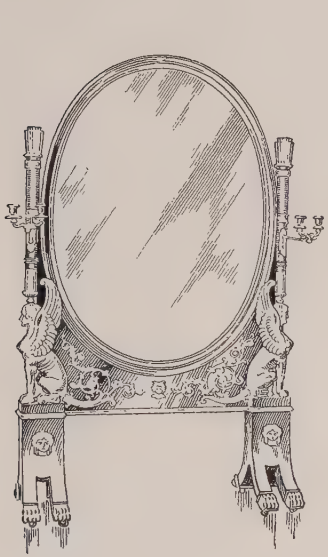


FIG. 66



(*a*)



(*b*)

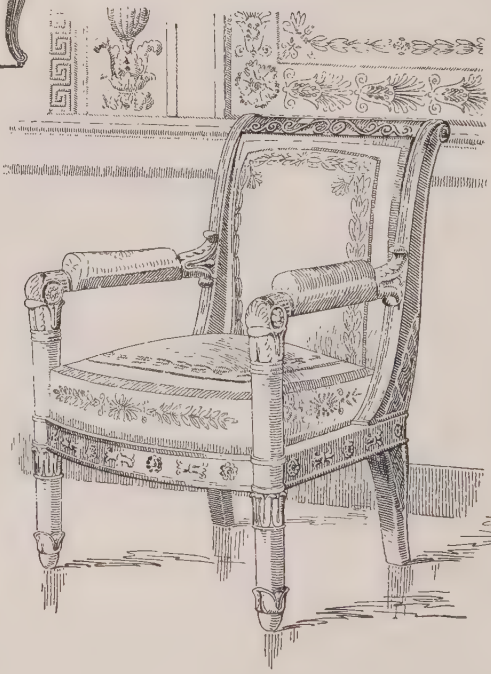
(*c*)

FIG. 67

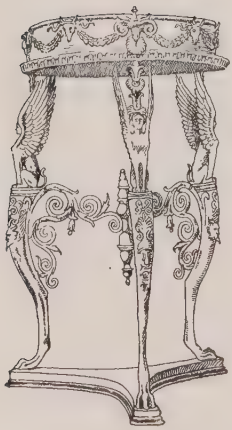
(*a*)

(*b*)

(*c*)



(*e*)



(*d*)

FIG. 68

were introduced into all schemes of decoration. The Pompeian arabesque suited the new conditions exactly, and during the transition, or **Directoire period,** as it was called, a decorative style developed that was afterwards called **Empire,** as it was adopted and encouraged by Napoleon when he became emperor, although it was created long before Napoleon was ever heard of. There was no detail in the Empire period that was introduced by Napoleon, except the laurel wreath and the crowned N.

The characteristics of the Empire period lie not so much in the designs themselves as in the application of the details. These details were executed in brass, or in gold, and were appliquéd against a dark ground of hardwood, such as mahogany, presenting at once sharp contrasts of color. There was little carving, and the metal appliqués of Greek and Pompeian design, with the laurel branches, wreaths, torches, bees, and the crowned letter N, constituted about all the ornamental devices. These devices were also woven in the fabrics, and in some instances were painted and inlaid in the wood.

99. In Fig. 66 is shown a room containing Empire-period furniture and draperies, but the walls are not carried out in harmony with the style. The cabinetwork, as will be observed, is left plain, being simply decorated with wreaths and festoons in appliqué metal. The lines of the molding were sometimes gilded, and often they were worked in solid metal as in Fig. 67 (*a*). Broad, unbroken panels, mostly in mahogany, are characteristic of the style. The walls were divided into long panels reaching to the ceiling, without a frieze, and were decorated either with rich arabesques of Pompeian origin, or with light festoons of laurel or flowers with pendant wreaths. Greek ornament and fretwork was also used as borders of wall decoration and as inlay in furniture. Tables and chairs were supported on straight, square, and turned tapering legs, and the former sometimes on lyres, as in Fig. 67 (*c*), eagles, as in Fig. 68 (*a*), and grotesque figures. The arms of chairs were sometimes

formed of Greek sphinxes, as in Fig. 68 (*b*), and the seats and backs were upholstered in brocade silks, the pattern of which partook of the same character as the painted ornament and metal appliqué, as shown in the upholstery and wall decoration in Fig. 68 (*e*). Sphinxes were also introduced as decorative supports for frames and cartouches, as in Fig. 67 (*b*), and as terminals to table legs in Fig. 68 (*d*). The lower portions of the table legs in Fig. 68 (*d*) are modeled after a dog's leg, and suggest the origin of the bandy leg so characteristic of the furniture of this and the previous period. There is certainly some relation between the leg of the Louis XV chair, Fig. 68 (*c*), and the characteristically Pompeian table shown in (*d*).

ENGLISH RENAISSANCE

100. The **English Renaissance style** was greatly influenced by the art of Holland and Flanders, owing to the great trade carried on with the two countries across the English Channel. This style can be divided into three periods: the *Elizabethan*, 1558 to 1649; *Queen Anne*, 1660 to 1714; and the *Georgian*, 1714 to 1820. Each of these periods presents great individuality, but unlike the periods of French Renaissance, this individuality is due to the work of individual designers and their influence rather than to the idiosyncrasy of the reigning monarchs. England had no foreign queen to influence local style, and there were no religious wars going on to deplete her treasury, as was the case in France. England was at this period more a copyist of surrounding countries (France, Holland, and Flanders) than of Italy, the home of the Renaissance style. Thus, many of the most characteristic details of the early Renaissance in England, unheard of in Italy and France, were elaborate adaptations of ideas borrowed from the simpler style in Holland, where long wars prevented the display of wealth in art and architecture.

101. Elizabethan Period.—In order to appreciate fully the character of the so-called *Elizabethan period*, which

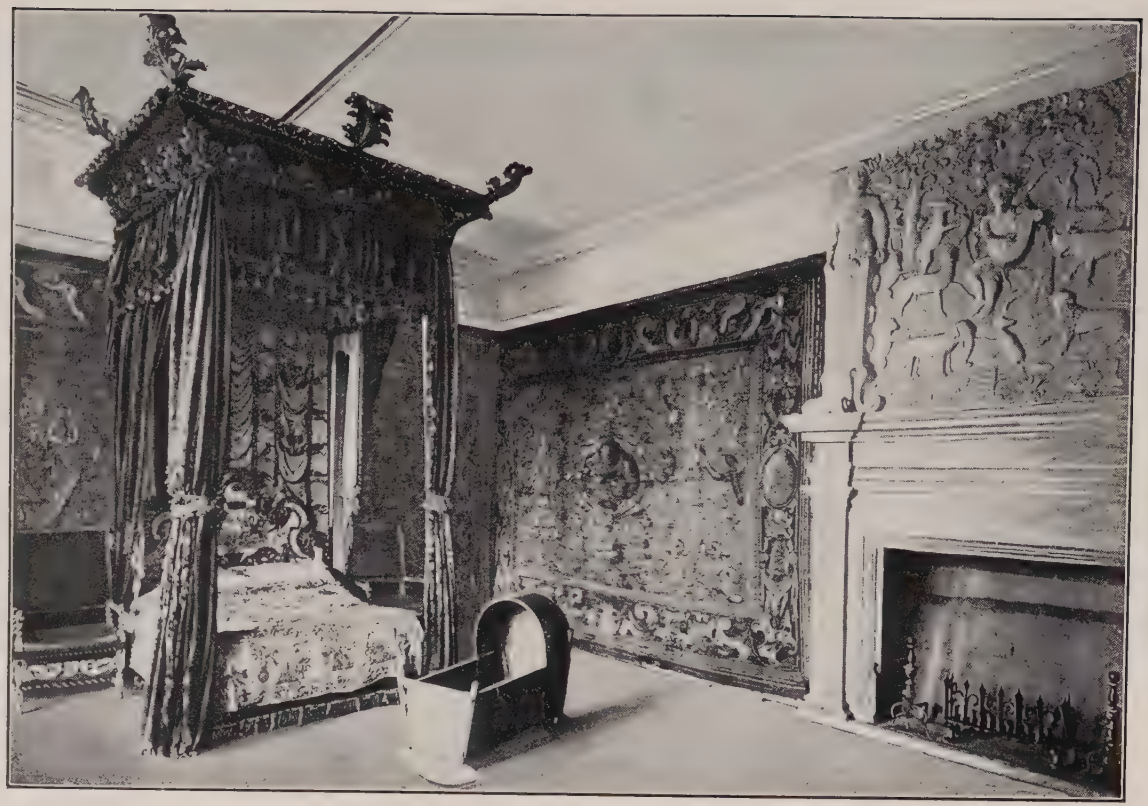


Fig. 69

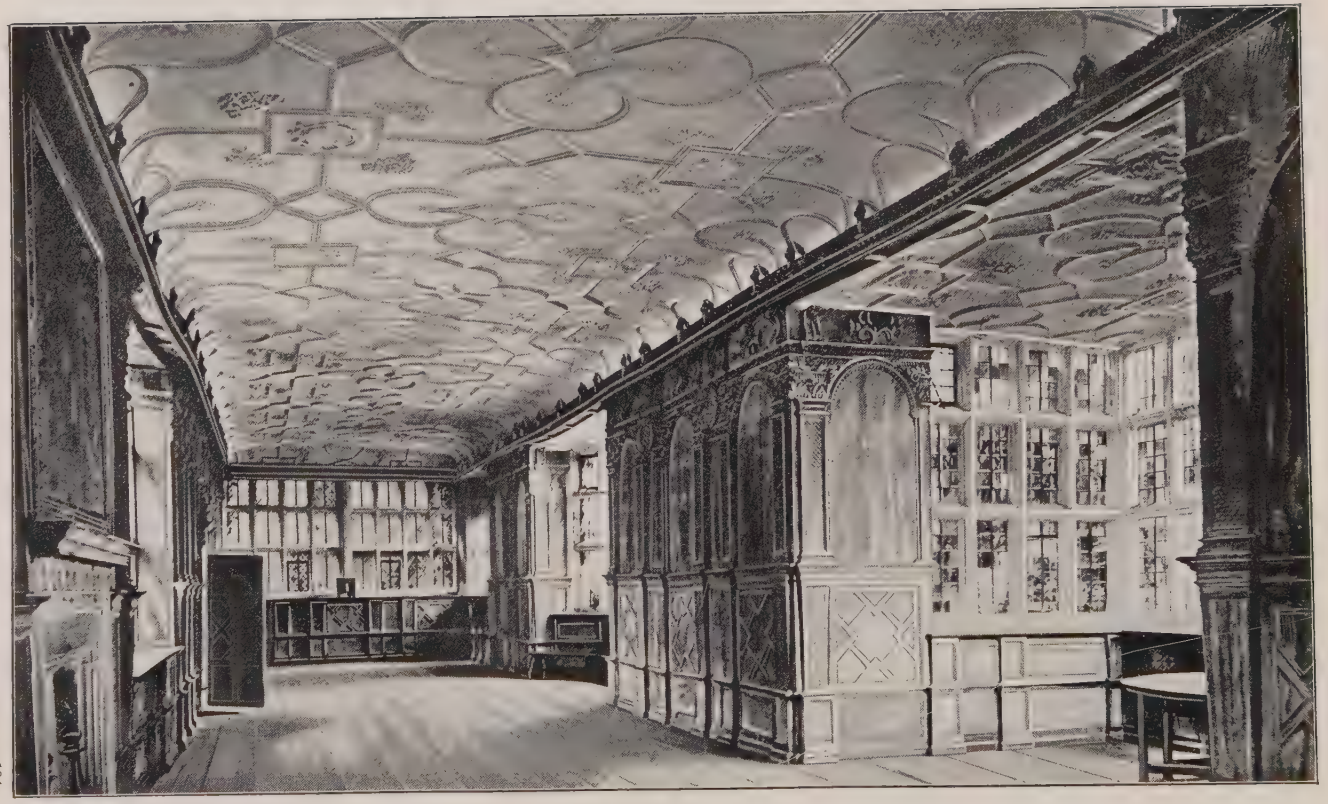
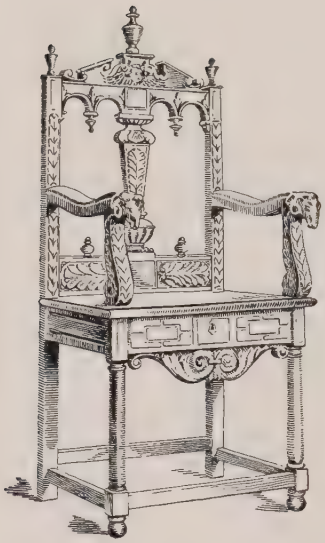


FIG. 70

really began in the reign of Henry VIII and extended into the reign of James I, it is necessary to turn back to the latter part of the feudal ages, when England was emerging into her modern civilization. With the invention of gunpowder,

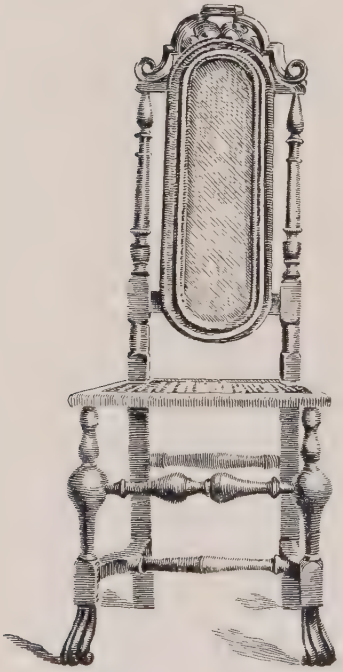
Fig. 71

the castle had gradually grown into a residence, and with the education of the Renaissance the residence developed into the modern English home (see *History of Architecture and Ornament*, Part 3). The old walls were still hung with the

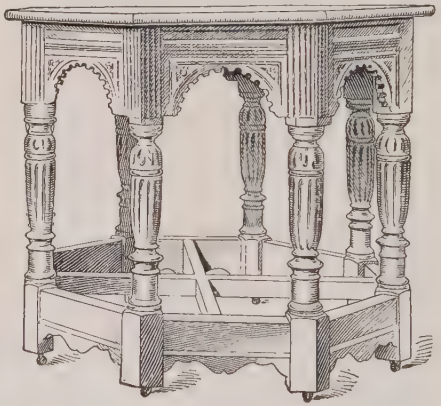


(*a*)

(*b*)



(*c*)



(*d*)

FIG. 72

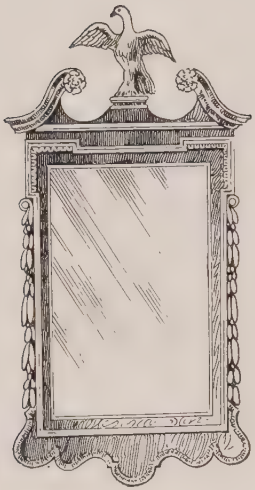
Gothic tapestries, as in Fig. 69, or they were paneled in rectangular bays, with columns and pilasters based on classic ideas borrowed from Holland.

102. In Fig. 70 is shown the long gallery in Haddon Hall, England, with its broad mullioned windows, and its arched panels between short, stumpy pilasters having paneled faces. The bases of the pilaster pedestals taper downwards, like the leg of a table, and the lower panels are divided into rectangular forms. This tapering of pedestals, newels, and balusters was characteristic of the period, and frequently these elements were richly carved in arabesque patterns and strapwork, as shown in Fig. 71. Grotesque figures holding heraldic shields surmounted the vase-like newels, and wooden-framed grille-work often served as a balustrade.

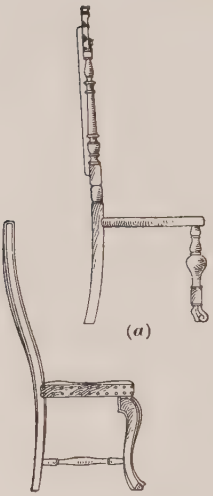
103. Beds with four posts and supporting an entablature and enclosed with draperies, based on the Dutch model, found service in the rooms. The chairs and tables, Fig. 72, were curious combinations of ideas borrowed from both France and Holland, and though quaint and picturesque in design, they were at first exceedingly uncomfortable. Rush seats were more in use for chairs than upholstery, and straight, high backs prevented a reclining position or an even rest for the spine.

The Flemish chair, Fig. 72 (*a*), presents the leading characteristics that are found in the furniture of the Elizabethan period, and while the Jacobean chairs (*b*) and (*c*) retain many of the Dutch characteristics they show a tendency to progress in the direction of ease and comfort. The seats of the earlier chairs were usually high for the reason that the absence of suitable floor covering made it desirable to keep the feet from the floor, and a plain stretcher between the two front legs was introduced as a suitable place to rest them.

104. Queen Anne Period.—Between the Elizabethan and the Queen Anne periods there is a break of eleven years, during which time England was under the rule of Cromwell and the commonwealth, and little or no progress was made

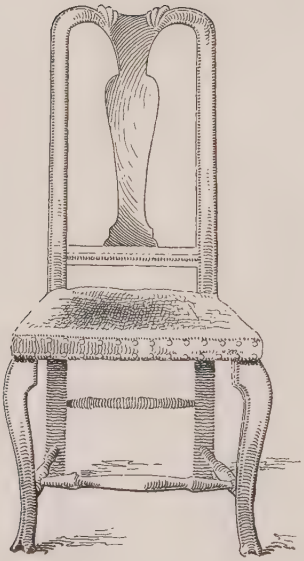


(c)

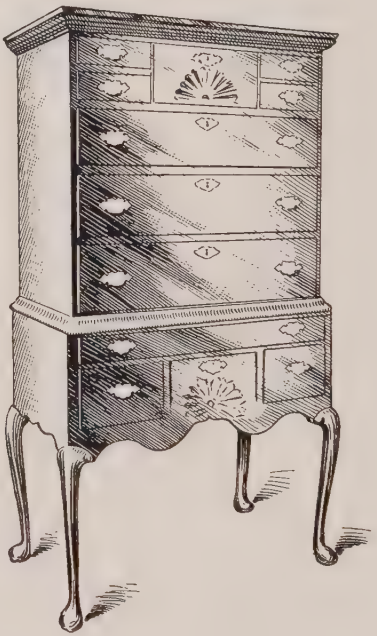


(a)

(b)



(d)



(e)

FIG. 73

in decorative design. In fact, during this period also, England was in a state of perpetual turmoil, and little encouragement was given to fine arts. The architecture became more classic in detail, and the interior decoration followed suit. Wardrobes, bookcases, and other heavy pieces of furniture were crowned with an open pediment, as were also the doorways, window frames, wall mirrors, etc., as shown in Fig. 73 (*a*). The fabrics that were hung as curtains, and also such as were used for upholstery work, were of Dutch manufacture, as there were no English weavers of note during this period.

105. After James II, William and Mary, both of whom were decidedly Dutch in their tastes, came from Holland to rule England. Mary, though a daughter of James II, had been married twelve years to William, who was governor of the Netherlands, and when they came to the English throne, they introduced into their new surroundings all the details of Dutch life. They had been living in Holland with all the accessories of a Dutch governor's household, and had been surrounded with the best the country could afford in the way of luxuries and embellishments. The furniture and ideas of decoration that they introduced into England were a Dutch development of the Italian and late French Renaissance, and it revolutionized the style then in vogue.

106. Elizabethan furniture, Fig. 72 (*d*), had been ponderous and heavy, as durability had not yet been looked upon as a quality to be separated from massiveness and great strength. Dutch furniture was strong and durable, yet it had an appearance of lightness, and the nobility and gentry hurried to their cabinetmakers with orders for furniture in the new style, in order to furnish their houses in a manner befitting the tastes of their king. Dutch furniture was imported by the shipload, and English craftsmen were forced to imitate the Dutch style or go bankrupt.

The one detail in the furniture that caused the greatest amazement was the *cabriole*, or *bandy leg*, Fig. 73 (*d*) and (*e*). It had existed in France for years and was also known in

Spain, but this was its first appearance in England, and, by itself, it revolutionized the style. Another innovation was the chair back. The Elizabethan chair, shown in (*a*), had a perpendicular back of straight lines only, but the back of the Dutch chair, shown in (*b*), was curved to fit the sinuous line of the human spine and inclined backwards.

107. An increase in literary taste introduced an improved form of desk, and the device known to this day as the *Dutch desk* was introduced during this period. It developed from the bureau. A top was added and pigeonholes and drawers were placed behind a slanting cover that turned down and thus formed a writing table.

The *high boy*, Fig. 73 (*e*), a term developed from the French "haut-bois," was a development of this period. It consisted of a bureau supported on four cabriole legs, although its Dutch prototype stood on six legs turned in the characteristic bulbous style of the Netherlands craftsman, as on the chair shown in Fig. 72 (*c*).

108. Holland at this time was working much in marquetry and inlay, and the Italian Renaissance scrolls are seen worked out in England with inlays of sycamore, maple holly, and mahogany. Oak, chestnut, and walnut were also used extensively. It was during this period that Louis XIV revoked the edict of Nantes, that had given Protestants throughout France an equal standing with the Catholics. As a consequence, many thousand skilled Protestant craftsmen fled to England and lent their skill to the development of the style. It was one of these Frenchmen that produced the "grandfather's clock,' which has survived as a favorite form of timepiece down to the present day.

The Queen Anne period was the mother style of the American colonial style in the British colonies, and the simple classic designs rendered in wood, with white enamel paint, characterized the homes of the American colonists.

109. Georgian Period.—The Dutch style, carried into England by William and Mary, was at first imitated and then developed by the English designers, and during the

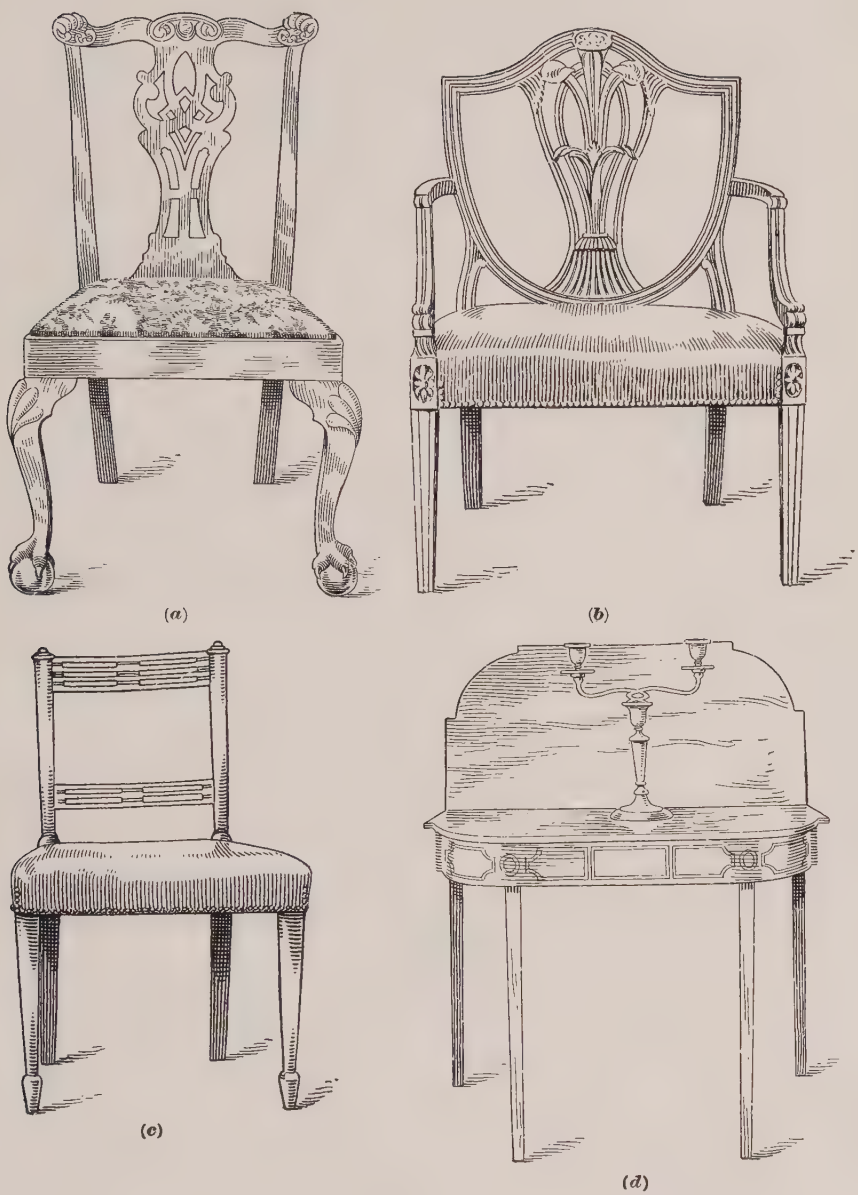


FIG. 74

Georgian period, the characteristics of decoration are found associated with the designers of several styles and their imitators. Chippendale, Hepplewhite, and Sheraton, the Adam brothers, and their followers dominated the character of the Georgian period. Chippendale adopted the cabriole leg of the Dutch chair and added to it the characteristic back of the French, as shown in Fig. 74 (*a*). Sheraton was a worker in marquetry and inlay, and consequently introduced square legs to his furniture in order to provide suitable surfaces for inlay. The chair shown in Fig. 74 (*c*) and the table (*d*) are designs of Sheraton. The round tapering leg with a conical foot, as in (*c*), is similar to some of the designs of Marie Antoinette. Some of these tapering legs were fluted or reeded as in the French style, but many of them were square, as in the table (*d*), with inlaid marquetry of rare woods. The Adam brothers produced a style of interior decoration and furniture based on the classic and Pompeian styles, with influences from the French Empire period. The Adam style was also popular in American colonial homes, and it found many imitators on this side of the ocean.

110. Robert Adam, the second of the three brothers, visited Italy about 1760 and studied the classic style. On his return to England, he and his brothers erected many buildings during the reign of George II, and the style speedily became popular. Roman influence is evident in all of their works, but the Pompeian details are stronger in the interior decorations. The rich and voluptuous scrolls and festoons of the Roman school became more attenuated in the handling of Robert Adam, and the same delicacy and refinement that characterized the French Empire period attended his designs.

From interior decoration, the step to furniture design was simple, and soon designs for furniture in the Adam style became popular. This style was an adaptation of the French Louis XVI style in form, with characteristic surface decoration introduced by Robert Adam. The chairs were small and

delicate, with low, narrow backs, while the legs were usually straight, but occasionally with an outward curve—never, however, with the compound curve of the Dutch cabriole. The sofas and backless couches were based on Greek ideas, but they were always of the same delicacy and frail appearance as the chairs. As Chippendale worked almost exclusively in mahogany, Adam adopted satinwood as his favorite material, and as the wood was new to the public of the period, it became popular as a novelty.

An innovation by Robert Adam was the painting of classic designs on the golden surfaces of the varnished satinwood. The designs were painted after the manner of inlay, but without any attempt at imitation or deception. The designs were executed in fine lines of classic detail and in soft colors, and were charming in their delicate simplicity. Occasionally, he introduced woven cane into the chair backs, running the strands to conform to the outline of the panels, whether oval or rectangular.

111. Hepplewhite, like Sheraton, followed the lines of the Louis XVI furniture, but although contemporary with Sheraton, he was not an imitator of the Sheraton style. Hepplewhite introduced the shield shape to the back of his chair, which was rarely upholstered, but formed an open frame for a central carved, or pierced, design, as in Fig. 74 (*b*). The shield back of Hepplewhite chairs was closed at the top with an even, sinuous curve, while Sheraton, who also used shield backs occasionally, used a broken rail for the top rail of the back. Hepplewhite's central shield was varied in each design, usually following the classic and occasionally inserting the simple upright slats, in the same manner as Chippendale. The legs were usually square and tapering, but they were not inlaid as they were in Sheraton's designs, nor were they painted as were those of the Adam brothers. Hepplewhite's furniture was usually executed in mahogany, and in this respect and for some of the treatments he applied to the backs, he undoubtedly borrowed ideas from Chippendale.

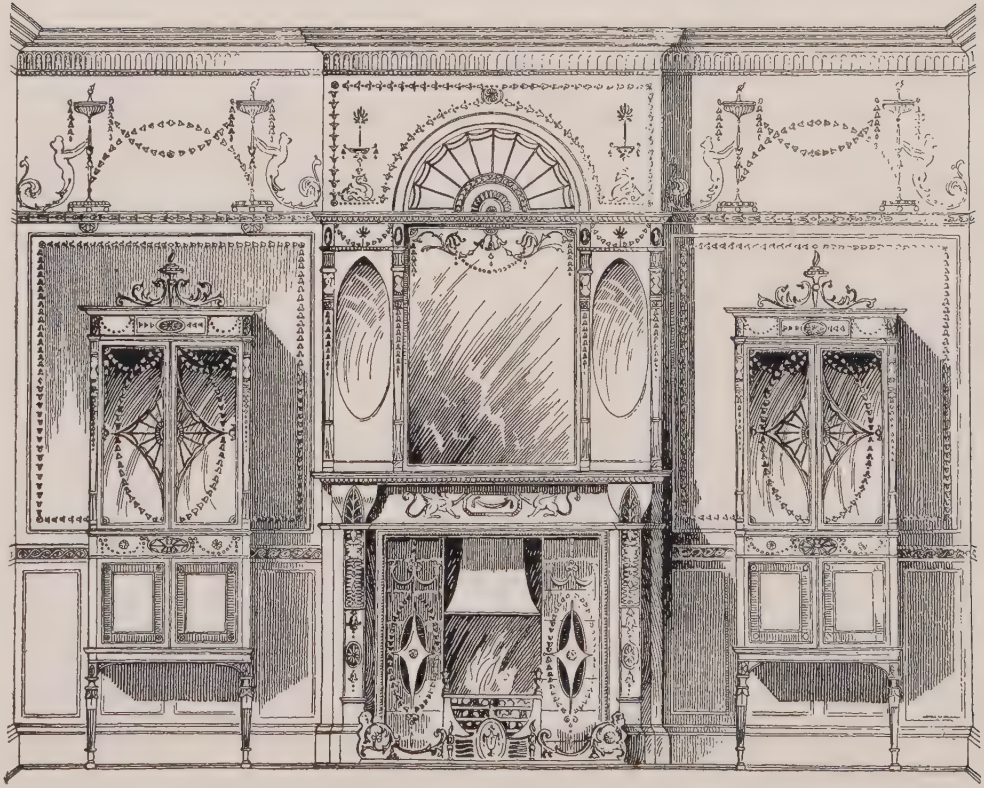


Fig. 75

112. The details of furniture design of the Georgian period were in harmony with the wall decorations, and therefore considerable detail is here given to the styles of these furniture designers, and in order to prevent confusion, the characteristics may be summed up as follows: Chippendale's designs were in mahogany, cabriole-legged, with backs after the Louis XV style. Sheraton followed the simpler lines of the Louis XVI style, but ornamented the surface with marquetry. Hepplewhite worked contemporaneously with Sheraton, but he did not copy Sheraton's ideas in any respect. While Hepplewhite followed the Louis XVI idea in chair legs and back forms, he adopted Chippendale's treatment of these in details and materials.

That part of the Georgian period that was dominated by the designs of the Adam brothers is particularly of interest to Americans, as these designs were the prototype of American interiors that are characteristic of the American Colonial period. Color is introduced into their decorative schemes in a most refined and delicate manner. The anthemion, scroll, and arabesque were modeled in panels, but they were contrasted with the background by a variation of color. Pale shades were used, and delicate tints of blue, red, and green formed either the background or the ornament, contrasting with which, gold was also used in some places, but very sparingly. The scrolls and classic ornament borrowed from Rome, however, did not partake of the rich voluptuousness that characterized the ornament of the time of the Cæsars. English social conditions demanded its refining; consequently, the ornament of the Adam brothers became delicate and attenuated, retaining the delicacy of the Pompeian and the richness of the Roman. In Fig. 75 is shown a characteristic Adam side wall with a mantel and cabinets. It presents many characteristics that afterwards emphasized the Empire period, but the Adam brothers died when Louis XVI was still on the throne of France.

PRESENT PERIOD

113. The 19th century produced nothing worthy of note in the way of a new style until its closing years. The Empire period had died in France with the downfall of Napoleon and the restoration of the monarchy. All the decorative ideas of the previous period being characterized strongly with the initial and devices of the emperor, they were speedily abandoned, and designers turned again to the scrolls and shells of Louis XV as being less obnoxious to the royalists. This had its influence in England, but not for any length of time, and an attempt was made to revive the Gothic style as being characteristically English. In the meantime, machinery was introduced for the manufacture of furniture and other decorative details, and under the dominating influence of the turning lathe and the scroll saw, all the individuality of the designer and craftsman was lost, and the designs of the day became meaningless and ugly. Besides this, black walnut was substituted for oak and mahogany, and the somberness of this material precluded the design of light and fanciful interiors.

114. Toward the end of the 19th century, a final effort was made to overthrow the hideous conceptions of the past fifty years and to establish something entirely new and worthy of an artistic people. This effort first showed itself in London, in what was termed the "æsthetic craze." A small coterie of enthusiasts "turned to nature" for inspiration, and produced designs in floral and other natural forms that were as inappropriate as they were novel. These æsthetes advocated the abandonment of all prevailing forms, even in dress, and recommended limp, flowing gowns and studied poses, while decorative surroundings were to be in trailing inert lines and the palest of colors. The idea was too absurd to gain popularity in this practical age, but it had the beneficial effect of diverting the public mind from copying the past. At this time, William Morris, the pioneer of the modern style, appeared and designed all manner of

details in a new form that was based on nature and without historic precedent, except in underlying principles.

115. The Morris idea was simply to turn to nature for inspiration, instead of copying and recopying something that some person had done before. His designs were based on natural forms, but they never pretended to portray these forms naturalistically. Morris lectured, taught classes, and wrote books, thus gaining many followers, and the modern *Morris style* in England, the *Craftsman style* in America, *L'Art Nouveau designs* in France, and the *Secession style* in Austria, are the outcome of this same idea. All four countries were working on the same principle, but they produced different results because of the different traditions that had influenced their history and the development of their crafts.

The style can be summed up as a craftsman's style, no matter what its local application may be, for whether in England, in France, or in Austria, it is based on the fundamental theory of designing to suit the material, purpose, and decorative possibilities of the article to which it is to be applied. In France, this style is deeply impressed with the influences of the better elements of the Louis XIV to Louis XVI styles. In furniture, it retains the shapes that were used during the time of Madam Pompadour and Marie Antoinette, but develops them with the details of the new style. In England can be seen the influence of the traditional Gothic; Germany and Austria run to grotesque and fantastic ideas; and in America, the crude forms of the Spanish Missions in California characterize the early efforts. But, taken all in all, the best results of this style are due to the training of the artist to be a craftsman, and the education of the craftsman along the lines of true art. The one may design and not execute, but he must thoroughly understand the possibilities of the craftsman and the tools employed in order to carry out the ideas set forth in the designs. The other may execute but not design, but he must be able to comprehend the artistic motives in the designer's mind.

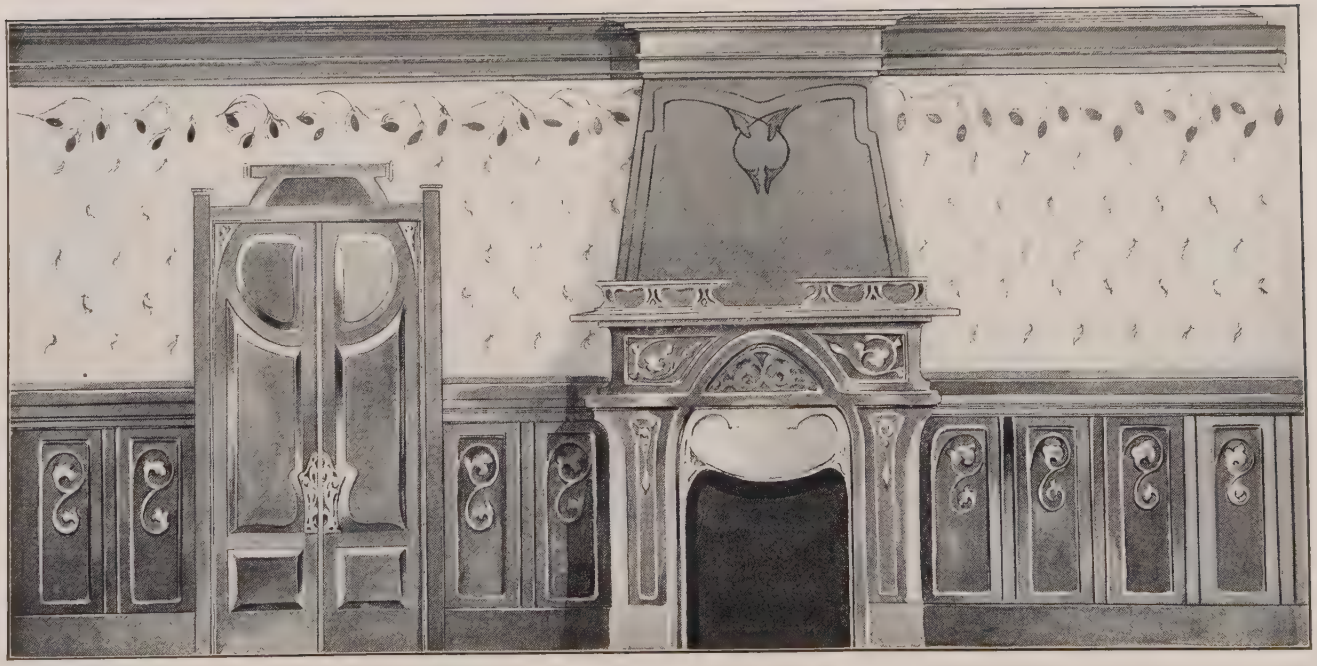


FIG. 76

Fig. 77

FIG. 78

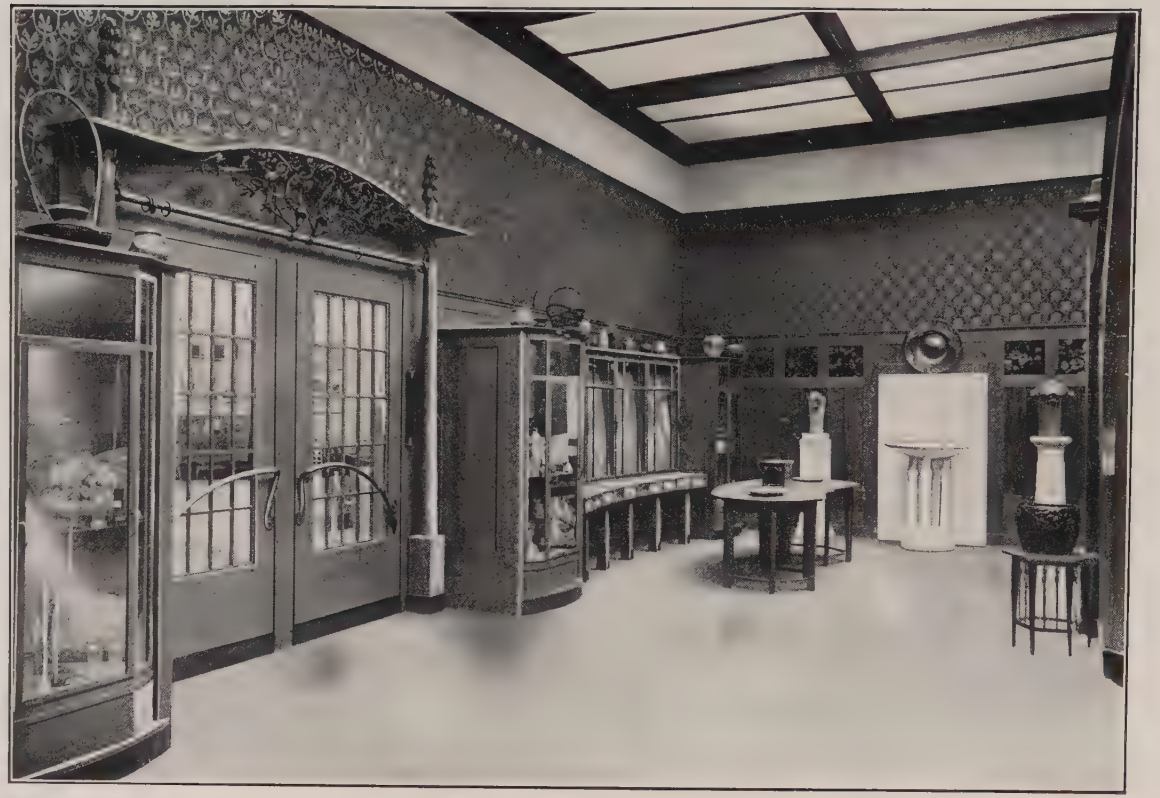


FIG. 79

116. L'Art Nouveau Examples.—In Fig. 76 is shown a design for the side wall of a room in the style called **L'Art Nouveau.** The motif used is the peacock feather, and the idea is well carried out. The frieze consists of a conventional distribution of the "eyes" of the feathers, while the field is spotted with the "tufts." The frame and panel of the door are somewhat Gothic in their structural honesty, but the sinuous curves and conventional treatment give the design great individuality. Furniture that har-

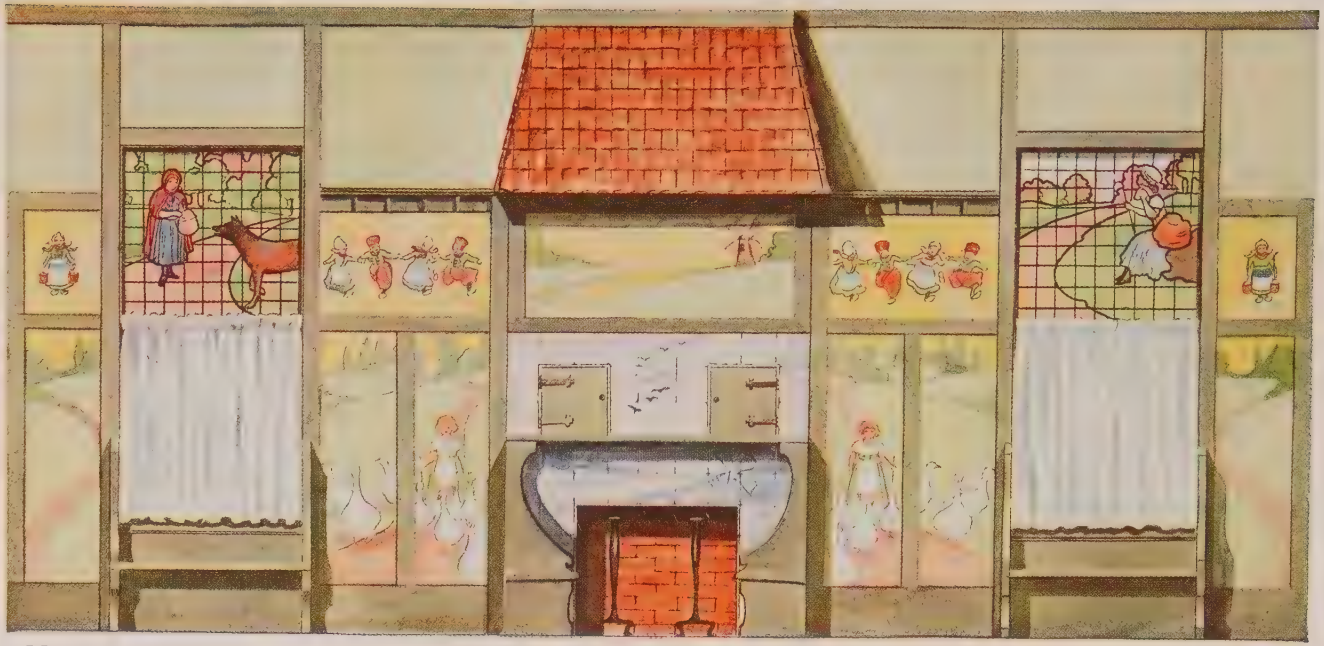
FIG. 80

monizes with this treatment is shown in Fig. 77 which is a photograph of the room worked out in the design shown in Fig. 76. The upholstery is in leather, and the wood is light-colored walnut, finished natural.

117. Secession Examples.—In Figs. 78 and 79 are shown two rooms finished in the Austrian style of this modern design, the simplicity of which is strongly suggestive of Japanese motifs. The walls are hung with decorated burlap, and the woodwork is in a weathered-oak finish. The

I L T 160 § 49

Fig. 81



I L T 100 § 49

FIG. 82

door treatment in Fig. 79, with its supports for a curtain pole and its free standing grille, is interesting. The sinuous curves that characterize the door framing in Fig. 77 are found in Fig. 79 in the hand rail across the glass.

118. Example of Morris Style.—The English treatment is shown in Fig. 80, which illustrates a simple folding screen with severely conventional renderings painted on its wooden panels, and the outlines of the forms cut in or burned in by pyrography.

119. Craftsman's Examples.—The simple craftsman's treatment is shown in the hallway, Fig. 81. This is the hall of the small dwelling plans for which are used as exercise in *Architectural Drawing*. Here, the walls were covered with a red cartridge paper, while the woodwork was worked absolutely plain and stained a weathered green. The result seems crude, but the design is very pleasing in its simplicity and at the same time is not expensive.

120. The use of battens against a wall of cartridge paper is shown in Fig. 82. The battens are 4 inches wide, and are placed so as to divide the wall into a pleasing variety of vertical and horizontal panels. The Dutch figures in the central horizontal panels are from a standard wallpaper pattern, and the sketches in the lower panels are rendered by hand. On each side of the fire opening is a low bench, and the chimney front is appropriately finished in Dutch tile. The chimney hood projects over the benches and is covered with small terra-cotta roofing tiles.

CEILINGS

121. Ceilings have ever afforded an inviting field for the display of decorative skill. They are always in plain sight, with nothing to obstruct the view, and are so situated that there is little danger of their defacement through contact with furniture or other fittings. Strictly speaking, a ceiling is the under side of a roof—whether it be the roof over a building or the roof over a room. In the decorative treatment of a ceiling, therefore, this fact should always be borne in mind. There are only two ways of treating ceilings; namely, *structurally* and *decoratively*. The former consists of the decoration of the vaults, or the beams that support them, and also the spaces and panels between these, while the other consists of a decoration entirely independent of the actual structural conditions.

122. The Gothic architects expressed their ingenuity in the molding of the vault ribs and the embellishment of the spandrels between them; or with the wooden construction in the decoration of the beams. The Renaissance designers followed out this system decoratively, but not structurally; that is, they decorated the vaults and beams as did their predecessors, but these vaults and beams were not always the vaults and beams that supported the roof or the floor above, but were either plaster or wooden imitations built over the apartments on a framework, entirely independent of the structural supports.

123. In Fig. 83 is shown the ceiling over the chapel of Louis XII in the château at Blois. Here, the ribs of the vaulting spring directly from the shafts of the columns, without any intervening capitals, and the vault soffits between these ribs are decorated in simple devices designed to suit their positions. This is a characteristic Gothic treatment—frank, straightforward, and structural, without attempt

to imitate something that was not really there, and with no effort to conceal the absence of details that later generations would have considered necessary.

124. The same will be observed in the timber constructions of this period, in which the beams are honestly exposed and their sides and enclosed panels decorated with suitable

FIG. 83

ornament. This treatment is shown in Fig. 84 (*a*), where heavy wooden girders *a b* support the lighter floor joists *a a*, *c c*, etc., and frame the long rectangular panels between. The decorative treatment makes no effort to hide this construction, but, on the contrary, emphasizes it by applying to the beam and girders a simple geometrical decoration, and to the panels, or more passive details, a light, fanciful

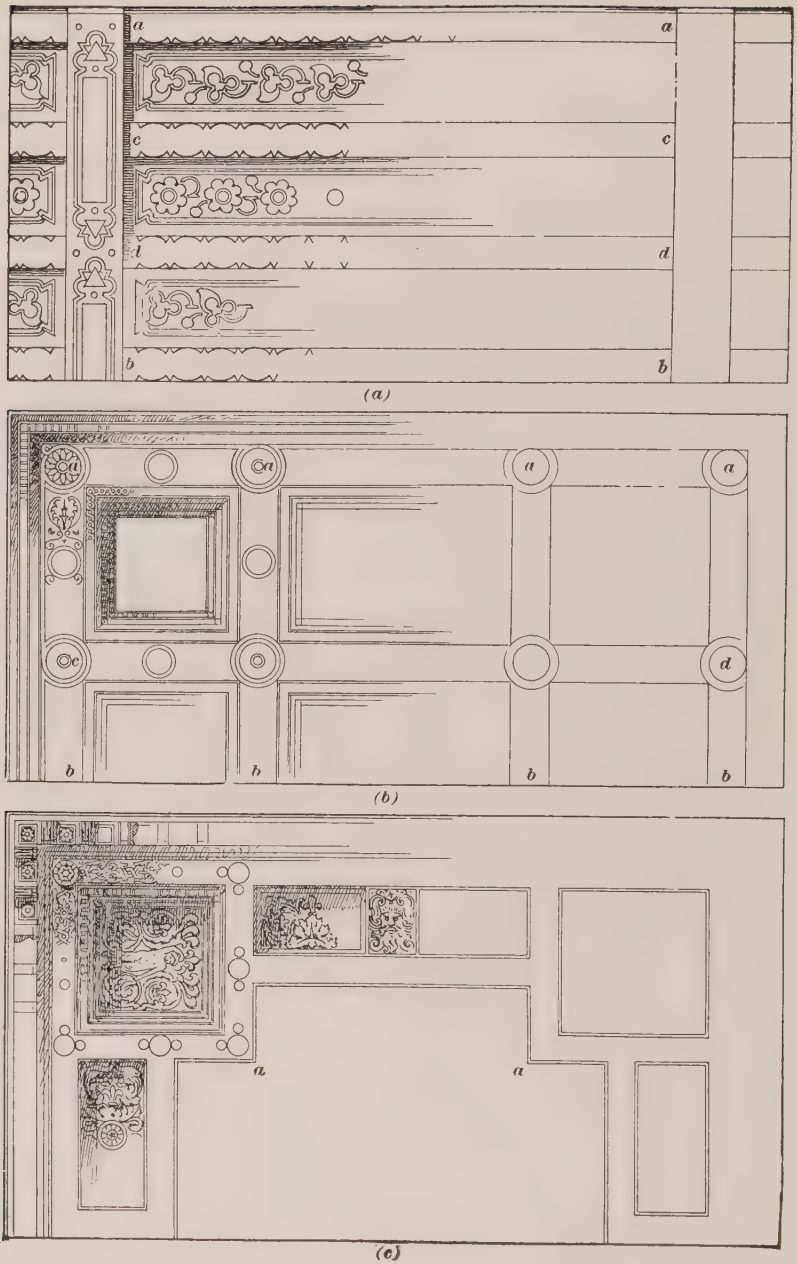
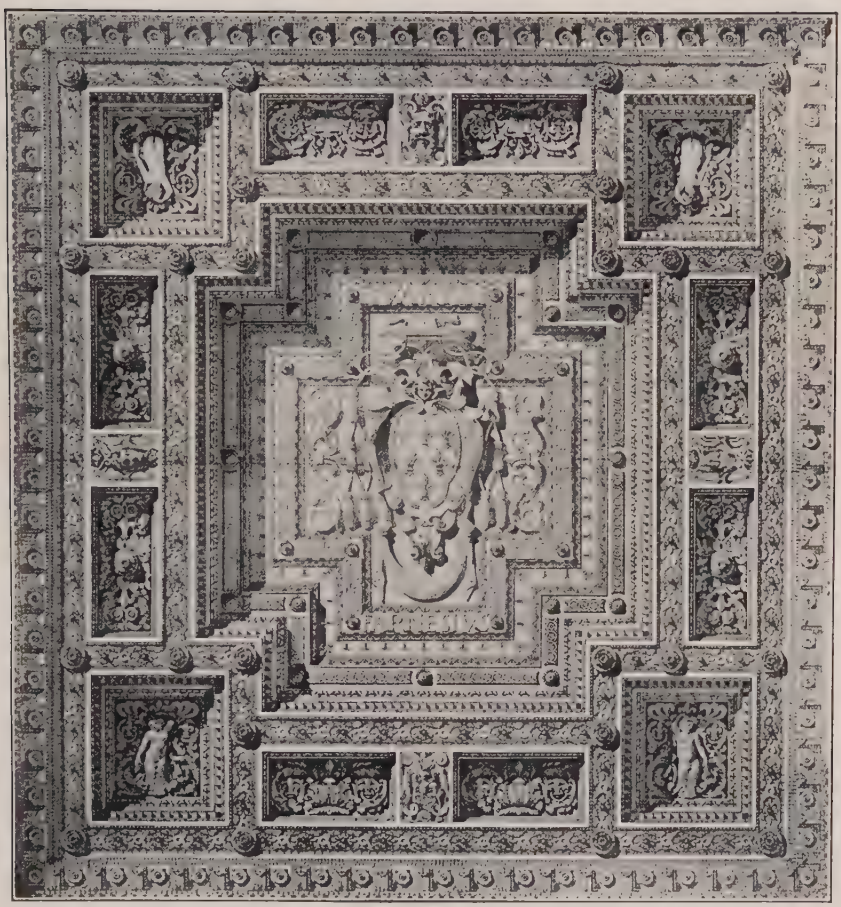


FIG. 84



127

FIG. 85

decoration. This ceiling, therefore, is purely structural and has in no way been altered to enhance the decoration.

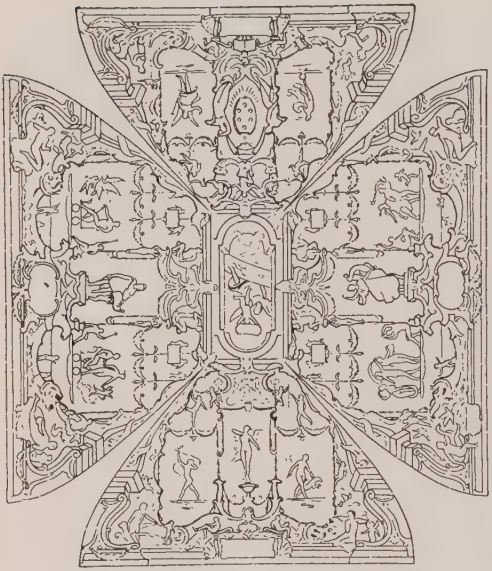
In (*b*), however, is shown a Renaissance design based on this same principle, but with the beams and girders all one size and spaced and framed into each other so as to form a number of square and rectangular panels of various sizes. The construction is independent of the real floor supports, but conforms to the structural idea, for the beams *a b* could be so placed, and the cross-beams *a a* and *c d* so framed into them as to produce a basis for this decorative effect and at the same time support the floor.

This is not true, however, of the design shown in (*c*), which is purely decorative and independent of possible structural conditions. None of the beams extend entirely across the room, and are therefore not supported at both ends. The structural idea has been ignored in order to produce a variety of panel widths along the sides and to secure a crucial panel in the center. The intersecting beams produce an overhanging angle at *a* that would not support any weight, and the design proclaims itself to be a plaster device built up under the real floor supports.

125. The latter system of designing was followed in one of the apartments in the Farnese Palace, and the resulting panels were richly decorated with relief ornament, as shown in Fig. 85. This figure illustrates clearly the general scheme to be followed in all designs for deeply coffered, or paneled, ceilings in the Renaissance style. Around the four walls of the room is carried a rich cornice, in this case, of the Composite order, upon which is supported the beams forming the panels. At the same time, the cornice is designed to represent the architrave of an entablature whose upper members form the decorative details of the panel moldings. The soffits of the panels are then decorated with characteristic devices suitable for the edifice.

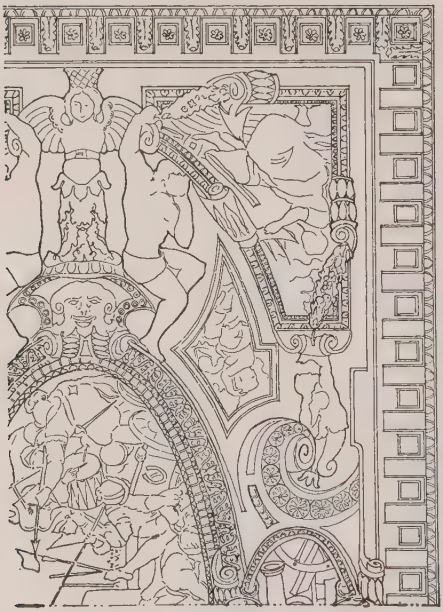
126. Vaulted ceilings and domes were constructed of plaster in a similar manner and then decorated according to the style desired. These vaults were not ribbed and groined

Fig. 86

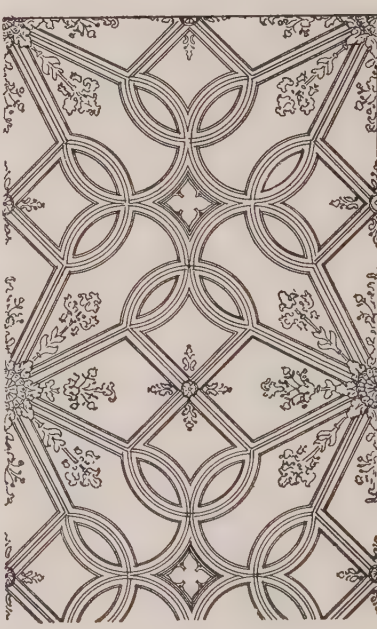


(a)

(c)



(b)



(d)

FIG. 87

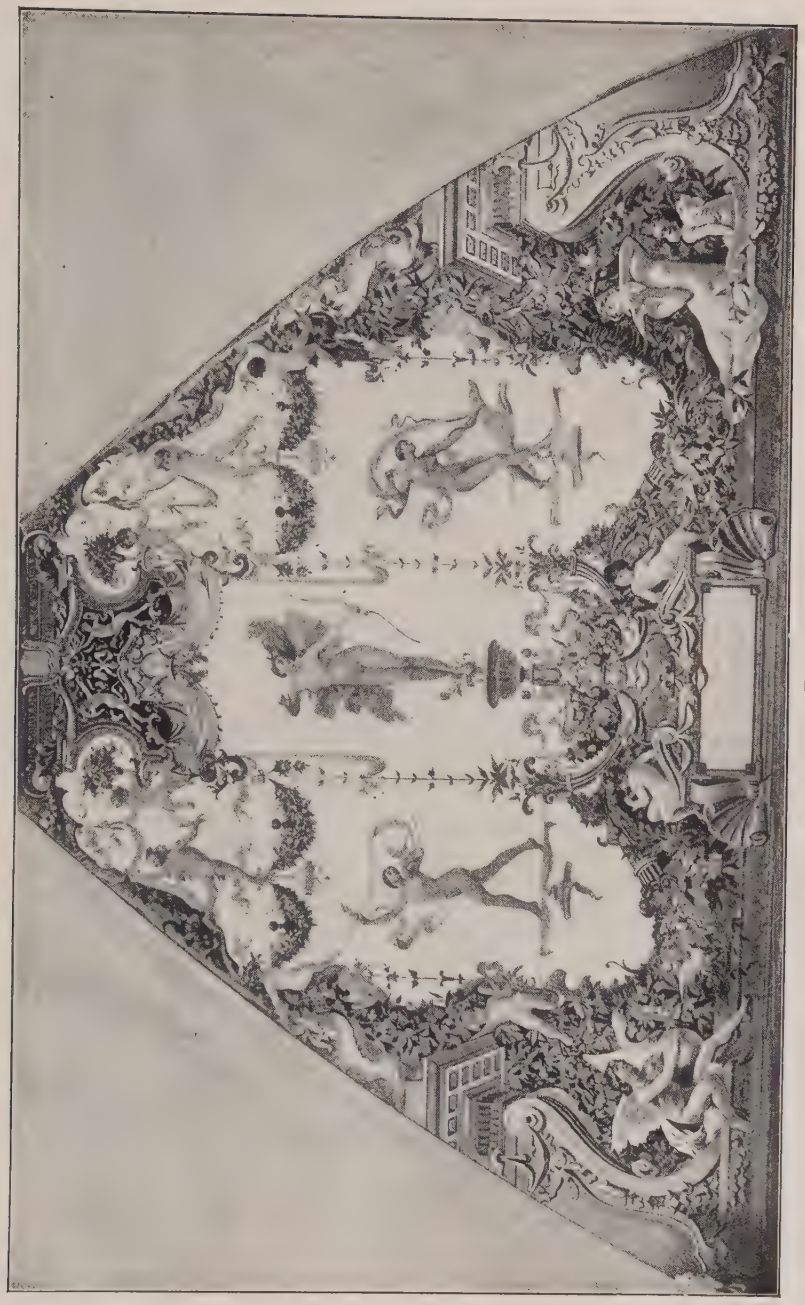


FIG. 88

as in the Gothic style, but were constructed to appear as the old Roman vaultings with elaborate paintings on their soffits and spandrels. Fig. 86 shows the ceiling of the Ducal Hall, in the Vatican Palace, as completed after the designs of Bernini. Each spandrel, whether semicircular or triangular, is filled with decorative details designed to fit the space that receives them, and at the same time presents historical or allegorical ideas characteristic of the period. The breaking up of the ceiling into a number of small surfaces renders large realistic or allegorical pictures impractical, but where a domed interior is to be decorated, the soffit of the dome lends a broad surface that can be very satisfactorily treated.

127. In one of the state apartments of the Villa Medici, the four sides of the room are arched over to form a cloistered vault, or square dome. The sides of this dome, if rolled out to form a flat surface on which the design is to be worked out, would present a set of spandrels of the form shown in Fig. 87 (*a*). Each of these sides presents a triangular surface, on which a design must be worked so that its edges will meet the bordering edge of the next triangle to it. The details of one of these designs, as proposed for the Villa Medici, is shown in Fig. 88, and it is characteristic of the style of wall painting of the later Renaissance.

128. Flat ceilings were introduced where the under sides of the floor beams were plastered over and presented an unbroken rectangle the full size of the room. The tendency, however, was to divide these flat surfaces into panels by means of heavy moldings and then decorate the panels with fresco or oil colors, as in Fig. 87 (*b*). The moldings of the panels were not deep and heavy, as was the case with the coffered ceilings, where an attempt at structural effect was made, but served as frames to set off the subjects that the designers wished to portray. Painted decoration was impractical with the coffered ceilings, as the deep beams and girders cut off the light.

129. During the Baroque period, the moldings enclosing these wall decorations became very heavy. They were

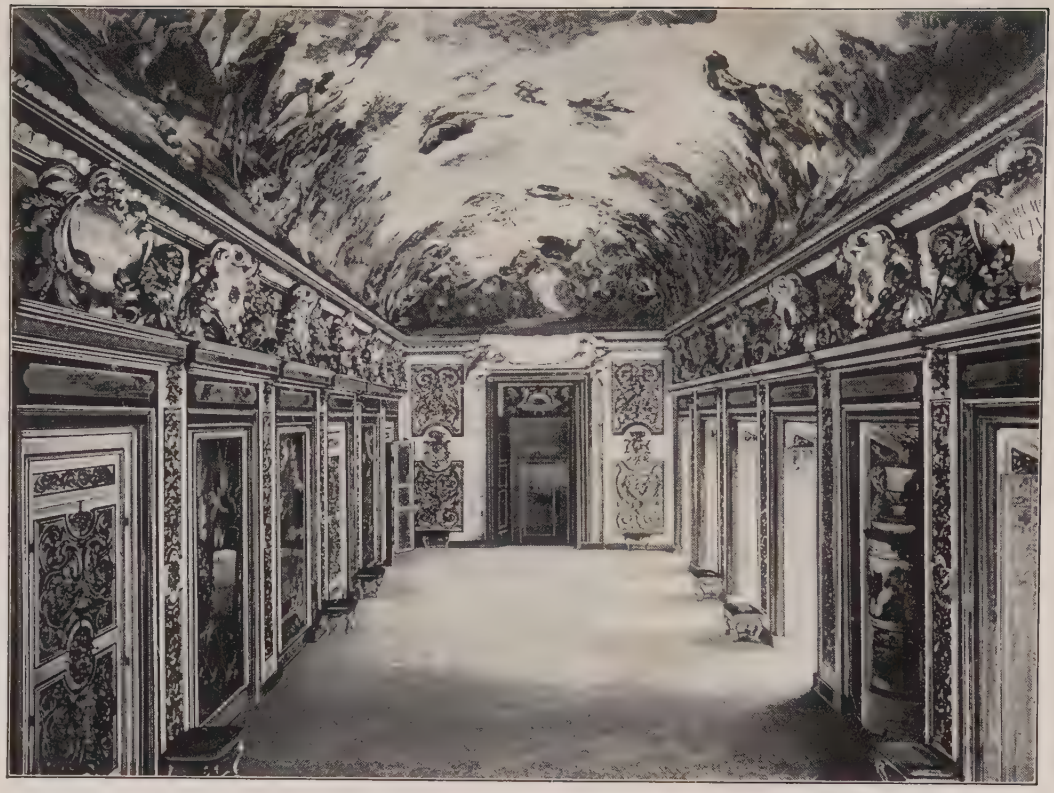


FIG. 89

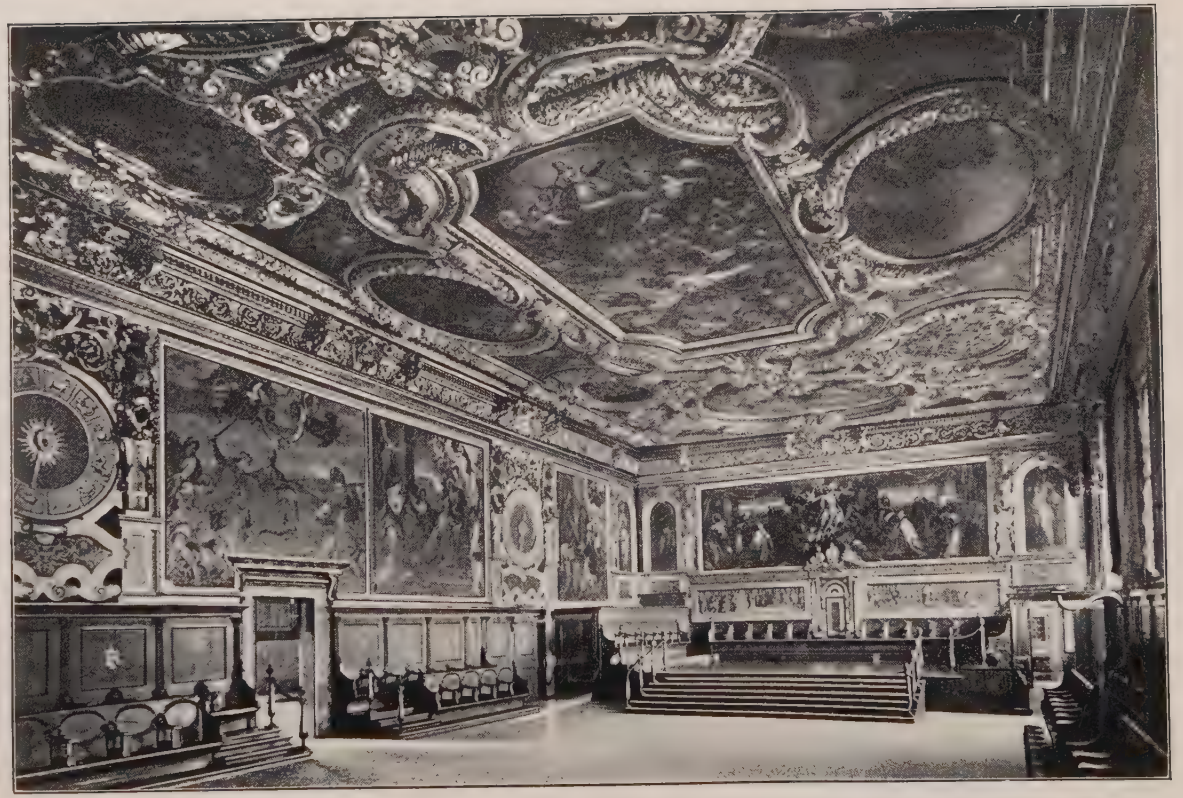
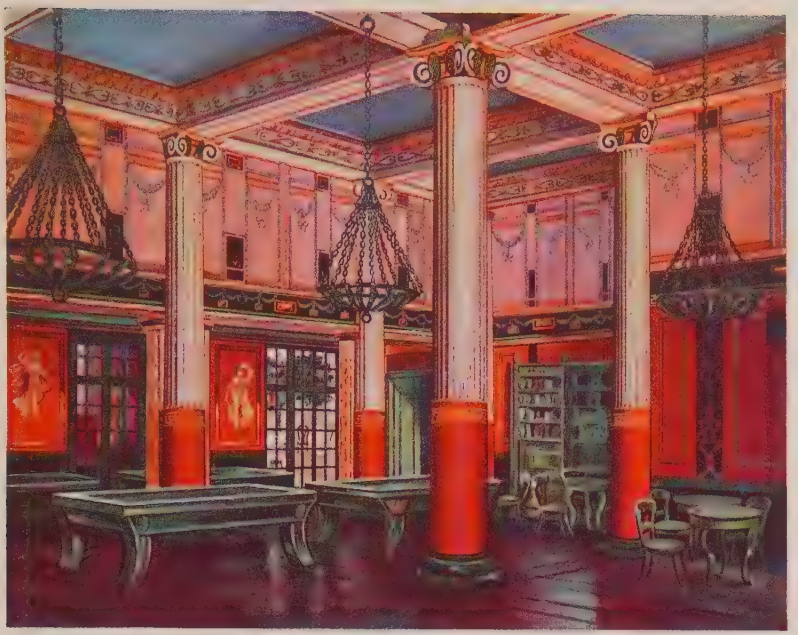


FIG. 90



(a)

(b)

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FIG. 91

(*a*)

(*b*)

I L T 100 $49

FIG. 92

(*a*)

(*b*)

I L T 100 § 49

FIG. 93

I L T 100 § 49

FIG. 94

(*a*)

(*b*)

I L T 100 § 49

FIG. 95

also richly gilded, giving a most luxurious, though rather bizarre, effect, but thoroughly in keeping with the pompous ceremonies of the day. In Fig. 89 is shown a ceiling in the Riccardi Palace vaulted over an elliptical center. The painting of historical subjects close to the frieze leaves them in a place where they are readily seen, and the lightening of the tones toward the crown of the vault gives a reflecting surface that lightens the gallery and heightens the effect of the apartment. Fig. 90 shows the Senate Chamber of the Ducal Palace, at Venice, the ceiling and side walls of which are painted with elaborate themes by the most noted artists of the period. The frames of these paintings are formed of heavy roll moldings of plaster burnished with gold.

130. During the Late French Renaissance, many ceilings were decorated with plaster moldings and ornaments, and then simply tinted in color instead of receiving elaborate portrayals of allegorical subjects. The ornament and moldings on these partook of the period they represented and harmonized with the other details of the room. Fig. 87 (*c*) shows a Louis XIV design, with a central panel surrounded by moldings and an outer border of light festoons. In England, during the Elizabethan period, molded ceilings became very popular, and the whole ceiling was laid out in irregular panels by means of moldings in low relief, as shown in Fig. 87 (*d*).

Whatever the treatment, care should be exercised that the ceiling decoration be proportioned to its height above the eye, and that it should be lighter in color scheme than the side walls of the room. Large moldings on a low ceiling tend to the feeling of heaviness, and dark-toned ceilings seem low and gloomy. On the other hand, small moldings and delicate decorations on a high ceiling are lost to the eye and produce a feeling of weakness. In a large room, the ceiling is a prominent surface when seen from the end of the apartment, and whatever the treatment decided upon, it should be such that the scheme can be taken in from one point of view without turning around to study it from another point.

MODERN APPLICATIONS

131. In the modern application of historic style, architects are permitted to take considerable liberty with the details of the style in order to fit it to conditions of modern times. In fact, in many cases a mere idea can be worked up according to ancient precedent and then carried out along modern lines, in which there is scarcely any parallel between the modern design and the ancient example that may have given rise to it.

132. A classic design is shown in Fig. 91 (*a*), which illustrates a Pompeian billiard room. The effect here is obtained by dividing the wall into two horizontal bands, the lower one of which is subdivided into broad, red panels. Painted on these panels are graceful figures of dancing girls, similar to those found on Greek vases, while the characteristic Greek fret is used as a border. The upper section of the walls is divided by alternate wide and narrow panels of a lighter tone of red, and, between these, light festoons of flowers are painted under a narrow frieze. The columns are of Roman Ionic, with the lower third harmonizing in tone with the lower side walls and the upper two-thirds rendered as in stone. On the lintel, or architrave, above the capitals, is painted Greek foliated ornament. The chairs and small service tables are pure Greek in design, and the billiard tables are modeled to follow the same lines.

133. In Fig. 91 (*b*) is shown a room in Spanish Renaissance. The effect here is obtained entirely through the color scheme and painted detail, whereas, in the previous example, the columns lent an architectural element that greatly assisted in the effectiveness of the design. The walls are frescoed in red, while the pilasters at the sides of the window openings are painted with Renaissance arabesque against a background of yellow. The upper walls

are decorated with the "arms" of several of the Spanish provinces, against backgrounds of green and yellow, and thus contrast most satisfactorily with the red field below. This strong effect of red and yellow, carried out even in the upholstering of the furniture, is what lends the strong Spanish feeling to the design. There is no specific architectural detail that characterizes the style, yet there can be no mistake as to the nationality of the design. This design illustrates how much can be accomplished in a decorative scheme simply by the judicious combination of characteristic colors and the introduction of a few typical emblems.

134. In Figs. 92 and 93 are shown four rooms that are almost identical in form and arrangement, but decorated in different periods. The treatment in Fig. 92 (*a*) is French of the Francis I period. Specifically, there is little to determine this in the design, except the form and upholstery of the furniture and the extreme simplicity of the details. The walls are unbroken by strong horizontal elements, and the spot-and-powder pattern of fleur-de-lis is the only typical French element present. The hangings are extremely simple and well suited to the quiet dignity of the design.

In Fig. 92 (*b*), the decorative treatment, in Dutch Renaissance, is even simpler than that in the previous example. A solid color for the side wall, with a conventional frieze of Dutch landscape, forms a background for the green hangings and characteristic upholstery. The form of the chairs is more Greek than Flemish, and do not seem so much in place as do the heavy sofas and the center table.

In Fig. 93 (*a*) is shown a treatment in the period of Marie Antoinette, while in (*b*) is shown a treatment intended to be Colonial. Here, the furniture alone gives the classification, as either room empty would pass as Colonial. The brocaded wall covering in (*a*) is not more characteristic of the French interior than many of the early American mansions, but the form of the furniture and the upholstery, in simple figured fabrics, leaves no doubt as to the style intended. The Colonial interior, in (*b*), with its chints-covered wall

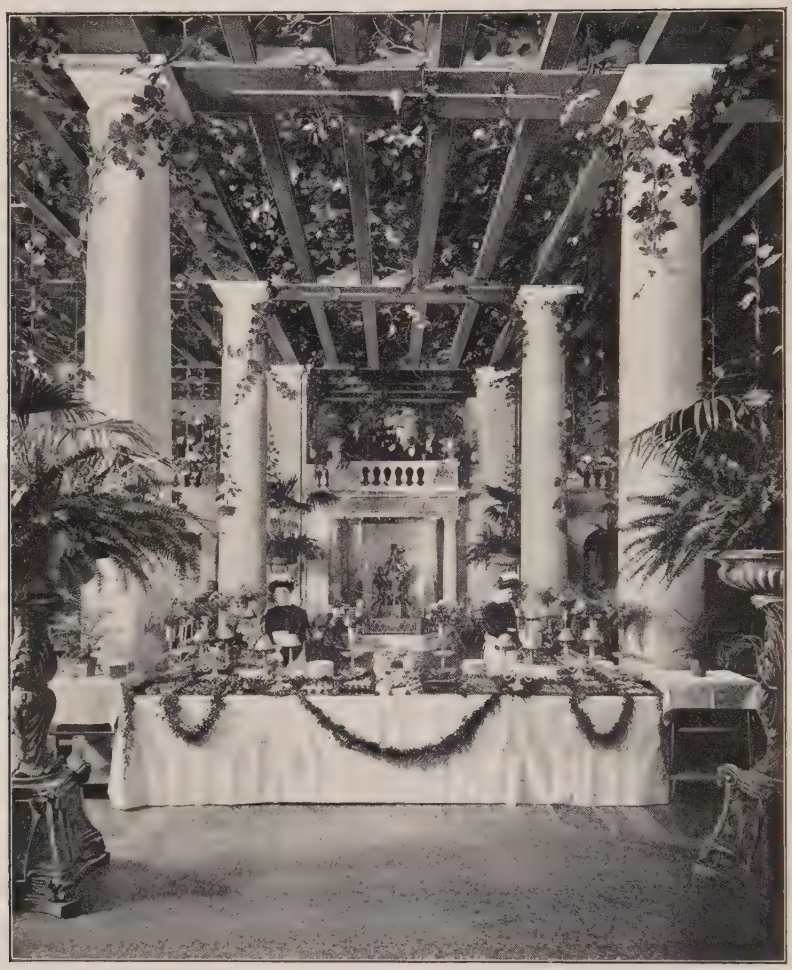

FIG. 96

and furniture and the mahogany pillar table, is so characteristic of the period that there is a feeling of complete harmony throughout the design.

135. In Fig. 94 is shown an American rendering of a design in L'Art Nouveau. This design is completely carried out, not only in the decorations and furniture, but also in the floor covering. The design is an interesting one from the harmony that exists throughout, and though not likely to find extended favor in practical American tastes, it possesses possibilities of development well worthy of study.

136. In Fig. 95 are shown two interiors treated in Oriental coloring. The Chinese effect in (*a*) was obtained through the wall decoration, which is in characteristic designs of the flowery kingdom, and through the introduction of hanging lamps. The rich East Indian design in (*b*) depends entirely on the treatment of the wall surface and the introduction of elaborately carved furniture in natural wood.

137. Fig. 96 shows one of the banquet rooms of the Hotel Astor, in New York. This interior is worked up in the style of a pergola, or a vine-covered trellis, such as were used by the Romans in their villas and gardens. This is an interior room covered with a ceiling, but the beams of the pergola are left exposed and artificial vines are carried over them, so as to give a complete garden effect. The palms and the exotic plants distributed about the room add to this effect and render it a very delightful surrounding for an evening's entertainment. The treatment here is the simplest possible, consisting of Doric columns supporting heavy beams, which in turn support lighter beams of the pergola. The beams of the pergola are in reality the casings of the ceilings above, but the vines are so interwoven between these beams, that the ceiling itself is entirely lost to view. If it were so desired, the ceiling could be so completely covered that it would be impossible to judge from the interior whether or not the room was an exterior one.

This may not be good architecture, but in this age of imitation, social conditions demand such extremes as this,

(*a*)

(*b*)

FIG. 97

and the attempt to carry out such a design to its fullest details is commendable in proportion to the success of the design.

138. In Fig. 97 are shown two views of a subbasement room designed along the lines of the typical German wine cellar. In (*a*) can be seen a long, narrow table with the straight-backed chairs each side, while elliptical wine tuns with richly carved heads are seen on the flanks and in the background. The piers and pillars here are the actual supports of the building above, and they are utilized with the vaults above to carry out the decorative scheme. The entrance to the room is shown in (*b*). Here, the doors are framed of vertical strips, over which great iron hinges are secured with heavy-headed nails. Within the door can be seen a statue of a monk standing against one of the piers. Three of these solemn, and at the same time grotesque, figures flank the approach to the table shown in (*a*), and thus lend much to the effect of the interior.

REVIEW EXERCISES

1. Make three sketches for ceiling treatment in a room 15 ft. $\times$ 20 ft. Scale, $\frac{3}{8}$ inch = 1 foot. (*a*) Italian Renaissance, rendered in pencil. (*b*) Louis XV, rendered in wash. (*c*) Oriental, rendered in color.

2. Make four sketches for treatment of a side wall 20 feet long and 10 feet high (with a door opening 4 ft. $\times$ 8 ft. in the center). (*a*) In Gothic, rendered in pencil or pen-and-ink. (*b*) In Italian Renaissance, rendered in pencil and wash. (*c*) In Louis XVI, rendered in color. (*d*) In Elizabethan or Queen Anne, rendered in the medium best suited to the design.

3. Make two sets of designs in color for private library or book room, drawing plan of ceiling, side walls with book cases, etc. One set is to be in some suitable historic style and the other to be in a strictly modern treatment.

4. Make four sketches in color or wash of side-wall treatment suitable for bedrooms, using standard wallpaper designs, either wholly or in part of the treatment.

5. Make two sketches for a dining room side-wall treatment, one in some historic style and the other in a modern wallpaper treatment.

NOTE.—In exercises 3, 4, and 5, accessories such as a fireplace, cabinet, buffet, doorway, etc. may be introduced as desired.